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# THE SURGICAL CLINICS OF NORTH AMERICA

Volume 2

Number 1

CLINIC OF DR. JOHN B. DEEVER

LANKEAU HOSPITAL

With remarks on Pathology by

DR. STANLEY P. REIMANN

LANKEAU HOSPITAL

## DUODENAL ULCER; PYLORECTOMY; POSTERIOR GASTROJEJUNOSTOMY

THE first patient I have the pleasure of presenting this afternoon is a male aged sixty-five years, whose chief complaint is gradual loss of about 15 pounds in weight during the past three years, but for the last six weeks, with rest and careful diet, he has gained 8 pounds. This gradual loss of weight was at first not associated with any symptoms except an occasional heavy feeling in the stomach and some belching of gas. About eight months ago the patient began to have attacks of epigastric pain, usually coming on three or four hours after the noonday meal, recurring on an average of two or three times a week. These attacks are not accompanied by nausea or vomiting. Bowels always regular; appetite good. No other symptoms.

Physical examination negative except heart rate irregular and force of contraction faint; percussion shows the presence of lung tissue between the heart and the chest wall. Abdomen negative except for some fulness in the epigastrium and slight tenderness to deep pressure over the middle of upper portion of the right rectus muscle. Blood-pressure systolic, 136; diastolic, 82. Urine examination negative. Blood examination: Hemoglobin, 80 per cent. red cells, 4,020,000; white cells, 7000.

polymorphonuclears, 69 per cent. Blood urea practically normal. Urine negative phenolphthalein elimination 68 per cent. in three hours. Hourly test meal acid reaction free hydrochloric, 24 total acidity 39. Negative for occult blood. Full meal no retention, nothing obtained by stomach-tube passed in eight hours.

x Ray examination, made in home town, negative except for pylorospasm. These plates were submitted to Dr. Pancoast, who reported no evidence of pathology although there were not enough plates for him to form a definite conclusion. x Ray work in doubtful cases calls for a large number of plates, in some instances it may be necessary to make 40 or 50 of one patient, in fact, I have known of one instance in which 150 plates were made before a definite diagnosis of a very small ulcer on the posterior wall of the stomach was made. The x-ray diagnosis in this case will consequently have to be ignored. The diagnosis is not by any means certain, but to me it appears that if there is anything organically wrong with the gastro-intestinal tract it is most likely in the duodenum. We are not at all definite as to that, particularly in the absence of careful x-ray examination, and in the absence of a very high total and a very high free acidity. Evidently there is little or no interference with the motility of the stomach, since there was very little recovered after the test-meal and nothing after the full meal. In cases of this kind, where the diagnosis is not clear that is, where there is nothing palpable, to establish a reasonably positive opinion it is first, last, and always to be remembered that the appendix may be responsible for a certain train of symptoms like those in this case including the loss of weight. It has been well said that in the majority of cases diagnosed as ulcer the pathology is in the appendix. The loss of weight may be the result of diet or of anxiety concerning himself such as the fear of malignancy or of some other serious ailment. In examining this abdomen I should suspect either gastroparesis or gastric dilatation, but from the capacity of the stomach it is hard to tell definitely which. This operation, therefore is primarily to determine whether or not there

is an organic lesion and if so whether or not it is operable. The question may arise whether operation is at all indicated that, I trust, will be answered positively in a very little while. As to the tentative diagnosis. Other common conditions of the abdomen which sometimes bear a similar train of symptoms are appendicitis, cholecystic and pancreatic disease. In the last two however there is frequently some history of jaundice although jaundice is also present at times in cases of duodenal ulcer and the pain is apt to be more paroxysmal in character and referred to the right costal margin, the back, and the right shoulder blade. The sex of the patient also plays a rôle since ulcer is more common among males, while disease of the gall-bladder seems to prefer the female sex. The indications in this case, therefore, are strongly in favor of duodenal ulcer.

We will open the abdomen high up through the right rectus muscle. It is best to incise the peritoneum during inspiration when the viscera are furthest away from the peritoneum rather than during expiration when they are in contact with the peritoneum and more likely to be injured. I have opened the abdomen but as the patient is not yet fully relaxed I will utilize the time by seeing whether or not I can deliver the cecum. There are extensive adhesions in the mid-abdomen of the great omentum to the peritoneum on a level with the umbilicus. On account of these adhesions I am enlarging the incision in the hope of being able to release them so as to add efficiency and safety to the operation. It is bad practice to tear adhesions without seeing what you are doing. By prolonging this incision I am able to see their point of attachment and note that they do not involve the intestines. I am therefore able to separate them safely. These may possibly have been responsible for a great deal of the symptomatology and if so they are what would be termed symptom-producing adhesions.

I am very careful to protect the viscera as much as possible from the iodolized skin surface, as well as from contact with the air. I am unable to bring up the cecum but by making traction on it I can expose the appendix and deliver it. Now the presence of such adhesions in the neighborhood of the cecum



together with a chronically diseased appendix, and the absence of other pathology in the lower right abdominal quadrant, would be suggestive of an old appendical inflammation. We also have some adhesions around the base of the appendix. The appendix being held by a piece of moist gauze and stretched out, I will tie off and sever the meso-appendix. I now tie the appendix itself rather close to its base and introduce a purse string suture through the serous and muscular coats of the cecum about  $\frac{1}{2}$  inch from the base. I then place a piece of gauze around the base of the appendix to absorb any excretion that may escape coagulation by the cautery knife with which I amputate the appendix. I also apply forceps to the appendix  $\frac{1}{2}$  inch away from the site of the ligature, thus minimizing the chance of material escaping from the distal end. I use the cautery knife quite hot, so that the heat will char the tissues cut through, as well as coagulate any fluid contents in the appendix. I am not content with simply searing. I may here remark that charred tissue within the peritoneal cavity such as the charred stump after the removal of the uterine appendage rarely if ever invites adhesions to neighboring viscera. The charred surface may be likened to a scab beneath which the healing process goes on. A charred stump leaves a normal endothelial surface, therefore is better than a stump which has been simply cut away and dropped into the peritoneal cavity. The appendical ligature is then cut away the stump inverted, and the purse-string suture tied and cut. I will look the ground over to see whether there is any oozing. It is all right, therefore I return the cecum to its normal position. Before going farther and examining the upper abdomen I will protect the incision by placing a piece of gauze over it and will take count of the small pieces of gauze. I now bring up the small end of the stomach, making traction on the same, and pull up with it the duodenum through the pylorus, which is perfectly painless, I can invaginate the adjoining duodenal walls. The anterolateral surface of the first portion of the duodenum looks as though it had been the site of an ulcer that had partly healed here the wall is infected and much redder than the

typical duodenal blush as well as less pliable than elsewhere. I note that the serosa of the gall-bladder is adherent to the duodenum by separating these adhesions I will get a clearer view and will be better able to show you the first portion of the duodenum. You note here that in addition to the adhesions of the gall bladder there are a number of small adhesions between the duodenum and the free border of the gastrohepatic (lesser) omentum. These are protecting adhesions. How wonderfully nature helps the doctor and how very often she does more for her patients than medicines can do but she does not always get the credit. I do not tell you this to discourage you, but only to make you a little more conservative in your views. I cut away the adhesions and ligate all the bleeding points.

With the duodenum well in view I am able to inspect and palpate it thoroughly. I note the presence of hardness and induration corresponding to the point of induration, already referred to. I am therefore able to say that this is unquestionably ulcer. From the duration of the symptoms and the failure to get permanent relief through medical treatment, operation is certainly indicated.

The next important question is the type of operation. I could merely invaginate the ulcer and infold the adjoining walls over. This method, I am glad to say is rapidly becoming obsolete, as it should. I could do a Balfour cauterization of the ulcer perforating the duodenum and closing the perforation, or I could cut out the ulcer with the indurated area or where the ulcer is small and favorably located a Finney pyloroplasty would be the best procedure and, finally I could do that which I usually prefer when feasible—a pylorotomy by amputating the duodenum below the ulcer bearing area and amputating the stomach to the proximal side of the pylorus, invaginating both stumps and finishing with a posterior gastro-enterostomy. When this is not feasible owing to the presence of exudate extending some distance down to the second portion of the duodenum which would make it impossible to invaginate the duodenal stump I do only a posterior gastro-enterostomy.

We will now open the lesser peritoneal cavity locate expose and tie the coronary vessels to each side of the ulcer. Having secured these vessels, I pass my left index finger into the lesser peritoneal cavity behind the pylorus and along the inner wall of the duodenum, when by directing the point of the finger forward I expose and clamp the vessels supplying this portion of the gut, and sever them along the duodenal side of the forceps. I next clamp the gastrocolic omentum close to its attachment along the greater curvature of the stomach to the point where I will cut through the stomach itself. All of these vessels and also the omentum in the grasp of the forceps are now tied. In this way I have freed the portion of the stomach and duodenum to be removed. I then apply two rubber-covered clamps, one on the duodenum below the site of the ulcer and the other on the stomach close to the pylorus, and cut through the duodenum and the stomach with a cautery knife. The duodenal stump is first closed by carrying a chromic catgut suture in a straight needle through the mucous membrane then through the serous and muscular coats. The clamps on the duodenum are now removed and a purse-string suture of linen carried through the serous and muscular coats of the bowel a sufficient distance below the end of the stump to permit invagination after which the suture is tied. The stumps of the omentum including the ligated pyloric and duodenal vessels are sewn to the invaginated stump of the duodenum for the purpose of reinforcement, in order to guard against possible leakage. I next close the opening in the stomach by sewing the two layers of mucous membrane together with a continuous chromic catgut suture threaded in a straight needle then the clamp is removed. The serous and muscular coats are then apposed. Any spurting vessels should be secured by ligature. The final suture is a continuous Lembert or (properly speaking) Dupuytren suture of linen, which at each end picks up the stumps of omentum containing the ligated right gastro-epiploic and coronary arteries.

The next step in the operation is to make the gastro-enterostomy. In making the anastomosis it is important to look the field over and see whether the posterior wall of the stomach

is accessible through the transverse mesocolon. If it is (as it usually is) the transverse colon with the great omentum is drawn out of the wound and by pulling these structures upward to the right the transverse mesocolon is put on the stretch and the origin of the jejunum brought into view. The transverse mesocolon is then carefully divided to the left of the middle colic artery and nearer to the vertebral than to the colonic border so that in the event of the subsequent development of a marginal ulcer there will be less likelihood of the colon becoming involved in the exudate, which may cause a fistulous opening in the colon. The opening in the transverse mesocolon is now enlarged sufficiently to allow the stomach to be brought out in order to make the anastomosis. I next engage the stomach wall at two places, picking up a fold of the stomach which runs in the long axis of its body and engage it between the left and middle blades of a three-bladed Roosevelt forceps. I then lay a small piece of gauze beneath the parts to be approximated. I now gently grasp the jejunum at its origin and apply the right blade of the anastomosis forceps so as to include 3 or 4 inches of the jejunum in its grasp turning the jejunum over from right to left. I might say here that sometimes there is a peritoneal fold binding the jejunum to the mesocolon when this occurs it should be divided up to its origin, so as to place the anastomosis as close as possible to the origin of the jejunum, and thus avoid making a loop. I replace the transverse mesocolon and the other viscera as quickly as possible, and thus have a free field, isolated by sterile gauze. The stomach and the jejunum are maintained in apposition by the clamps and are united by a seroserosus continuous suture of linen started at the left end and carried over to the right, leaving the thread long, with the needle attached, for future use. An incision is then carried through the serous and muscular coats about  $\frac{1}{2}$  inch to either side of the line of suture, making the mucous membrane protrude in hernia fashion. With chromic catgut, commencing at the right, a continuous suture is carried over the middle blade of the forceps through all of the coats of the jejunum and the stomach except the mucous membranes.

The protruding mucous membranes of the stomach and the jejunum are then cut through and the suture again passed from left to right through all the coats of the two viscera until the end of the wound is reached. This makes the posterior margin of the new opening. The same needle is then carried through the wall of the jejunum from within out, about  $\frac{1}{4}$  inch from the cut margin. Crossing to the stomach it is carried through that organ from without in, at the same distance from the cut margin then from within out, and over to the outer wall of the jejunum, where it is carried from without in, and continued in this way until the openings in the stomach and the jejunum are closed. This constitutes a continuous mattress, or Mayo or in-out and-over suture. The thread is, of course then tied and cut away. Now we take up the very first linen thread and carry it from right to left as a continuous Lambert Dupuytren suture. This suture is the first and the last one used the alpha and the omega of the method. I now grasp the anastomosis, holding the stomach and duodenum well up and at  $\frac{1}{4}$  inch distant from the end of the opening attach the jejunum to the stomach. This is done to prevent spur formation at the inner end of the opening and to allow the uninterrupted passage of the jejunal contents from the proximal to the distant limb of the jejunum.

We are now ready for the final step in the operation—closing the upper margin of the opening in the transverse mesocolon by attaching it to the stomach distant to the anastomosis. This is better done by tying than by sewing, because it obviates the risk of wounding any small vessels that may be present. This closure of the opening in the transverse mesocolon prevents the possibility of internal strangulation of the bowel into the lesser peritoneal cavity. Some surgeons sew the upper margin of the opening in the transverse mesocolon to the suture line of the stomach and the jejunum. But I believe there is less likelihood of interference with the function of the gastro-enterostomy opening by attaching the upper margin of the opening in the transverse mesocolon to the stomach wall.

We now remove the gauze surrounding the field of opera-

tion, inspect the posterior line of sutures, see that everything is all right, replace the viscera in the abdomen, draw the great omentum down over the small intestines, take account of the gauze sponges, pads, etc. and close the wound.

Now I will examine the specimen. It is, as you know an ulcer and is crater like in appearance. I will have it put on a platter because medical students now-a-days must have every



Fig. 1 — Chronic gastric ulcer near the pylorus.

thing handed them on a platter. I will ask you not to handle the specimen, but simply to look at it very carefully. The ulcer is in the smaller end of the opening. It has a little slough covering the surface. The portion that corresponds to the site of the slough is the most dependent part of the ulcer. Let me call your attention to the difference in appearance between the serosa and mucosa. If the ulcer had not been excised the appearance of the serosa of the duodenum would be such as to make

The protruding mucous membranes of the stomach and the jejunum are then cut through and the suture again passed from left to right through all the coats of the two viscera until the end of the wound is reached. This makes the posterior margin of the new opening. The same needle is then carried through the wall of the jejunum from within out, about  $\frac{1}{4}$  inch from the cut margin. Crossing to the stomach, it is carried through that organ from without in, at the same distance from the cut margin then from within out, and over to the outer wall of the jejunum, where it is carried from without in, and continued in this way until the openings in the stomach and the jejunum are closed. This constitutes a continuous mattress, or Mayo or in-out and-over suture. The thread is, of course then tied and cut away. Now we take up the very first linen thread and carry it from right to left as a continuous Lembert Dupuytren suture. This suture is the first and the last one used the alpha and the omega of the method. I now grasp the anastomosis, holding the stomach and duodenum well up, and at  $\frac{1}{4}$  inch distant from the end of the opening attach the jejunum to the stomach. This is done to prevent spur formation at the inner end of the opening and to allow the uninterrupted passage of the jejunal contents from the proximal to the distant limb of the jejunum.

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We now remove the gauze surrounding the field of opera-

gastric ulcer because carcinoma engrafted on duodenal ulcer is rare. There are three things which stare an ulcer subject in the face perforation hemorrhage malignancy especially in gastric ulcer

Let us pause for a moment to consider the conditions and the symptoms which so closely simulate ulcer as to make a correct diagnosis impossible. In the great majority of cases of duodenal ulcer a diagnosis can be made by x ray although this



Fig 3—Low power semidiagrammatic drawing of carcinoma cells streaming into the surrounding tissue.

statement must be qualified by the remark, "depending upon the roentgenologist. In experienced hands x-ray diagnosis can be relied upon, but in the hands of the inexperienced it is scarcely ever reliable. In cases in which the plates give no definite information as to ulcer we have often to come back to that old sinner the appendix, especially when it occupies a high position. Or we may have to consider the gall-bladder or the pancreas responsible for the symptoms but as pan



you think the ulcer had been healed, but, as you know this is not the fact. I want to emphasize this point so that when in the future you hear the internist or the stomach specialist discourse on the healing of chronic ulcers under medical treatment you will know that they are mistaken. Dr Reimann, the *Chief of the Pathological Laboratory* will discuss this aspect of the subject with you.

Now I imagine some of you are wondering why I chose to do a pylorotomy in this case. Well, it is the *most radical operation*, and, as a rule in surgery that which is most radical is the most conservative in the end. It was practically as easy as any

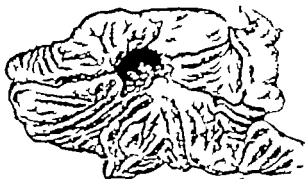


Fig. 2—Ulcerating form of gastric carcinoma.

other operation, and that means it is the safest for the patient, for that which is the easiest for the surgeon is usually safest for the patient. Furthermore having done a pylorotomy including the ulcer I have an empty house and not a questionable tenant, and an empty house is certainly preferable to an undesirable tenant. By the removal of the ulcer I have relieved the patient of any possible chance of perforation and hemorrhage, certainly a great advantage. Now if the ulcer had been gastric instead of duodenal I could also say that I did him great good in protecting him from subsequent carcinomatous transformation. I cannot speak so strongly in the case of duodenal as of

As to chemical analysis, high acidity is generally regarded as characteristic of ulcer and low acidity or anacidity of carcinoma while occult blood and in some instances microscopic blood, of both ulcer and carcinoma. The abdominal surgeon can tell you that this is not proved at operation. Very often low acidity or anacidity are seen in cases merely of appendicitis or of cholecystitis. In the presence of occult or microscopic blood how often have I found neither ulcer nor carcinoma but a toxic gall-bladder.

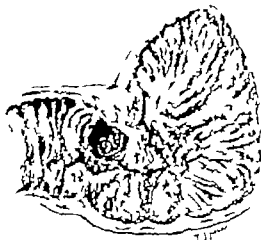


Fig. 4.—Gastric carcinoma at the pylorus rising probably in previous ulcer.

I want to impress upon you particularly the importance of the study and careful interpretation of the history. Careful palpation, to determine areas of tenderness and rigidity or the presence of a mass, with percussion and auscultation are also of paramount importance. In indurated duodenal or pyloric ulcer tenderness will be elicited upon deep pressure made with the tips of one or two fingers over the middle of the upper segment of the right rectus. Tenderness elicited upon pressure opposite the point of the ninth costal cartilage and immediately

creatitis is not common except when associated with cholecystitis the two may well be considered together

As to diagnostic methods, I cannot say that I derive much information from the products of gastric or duodenal lavage, or from laboratory tests except gastric analysis of a test meal or a full meal, or both. I am aware that most doctors prefer to send their patients to have x ray pictures taken, to use the language of the patient, but I believe that gastric analysis is as reliable as x ray except in the presence of actual deformity in the shape of an excavation, or of interrupted peristaltic waves, or roughening of the mucosa, or deformity from the outside, pressure being due to a mass of crippling adhesions. The capacity of the stomach can well be determined by inflating it with air and by percussion the stomach can be outlined and marked on the abdominal walls then, after allowing the air to escape the stomach can be filled with water and again by percussion the area of dulness can be marked and allowing the water to escape the amount escaping can be measured, and thus give information that is not otherwise obtainable. The degree of retention can be determined by giving a test-meal and passing the tube in one hour or with a full meal at the end of eight or ten hours. This, I know may meet with the objection that it can just as well, if not better be learned by means of the bismuth or barium meal and the fluoroscope with much less discomfort to the patient. As far as the patient's comfort is concerned, this may be true but as to the greater precision, that I cannot concede. Very often where the x ray has shown retention, in the absence of pyloric obstruction I have been able to satisfy myself with the tube that there was no retention, and have had my observation confirmed at operation. Chemical analysis of the gastric and duodenal contents makes more impression upon the patient than upon the experienced surgeon. This applies also to the recent introduction of the treatment of certain upper abdominal disorders by duodenal washings injections of serums, etc. Diagnosis in these cases when brought to the operating table, as many of them eventually are has rarely been sustained by the pathology exposed at operation

pus has been evacuated only and the appendix not removed, that he will have no further attacks of appendicitis. Every surgeon knows that this is not the case.

Justice also impels me to say that not all patients are cured by operation. Sometimes there is a return of symptoms and the patient comes to the hospital for the removal of the anastomosis, as in the following illustrative case of a young man recently operated upon in this hospital. For the past three years he has had intermittent pain about the heart due to pressure of excessive gas in the epigastrium also frequent head aches. He was operated upon in another hospital in April, 1921 for appendicitis, without relief of symptoms, and again at the same hospital in September when he had an ulcer excised and a posterior gastro-enterostomy done. He still complains of the same symptoms consisting mainly of a continual pain around the heart and soreness in the epigastrium, moderate belching of gas and passing of flatus. Since the second operation he has been able to eat almost any kind of food, but always drinks a great deal of water at meals. This causes a great deal of gastric disturbance, with nausea so marked that the patient often feels obliged to empty the stomach with a stomach-pump. Appetite good. Bowels have been extremely constipated since the last operation. Loss of 20 pounds in weight in the last two months feels extremely weak and has been in bed since September. Unable to pass more than about 4 ounces of urine at any time, although there is no great frequency. Nocturia two or three times. No cough, cold, or night-sweats. This is evidently a case of vicious circle which can be relieved only by operation.

At the operation an upper right rectus incision was made. Many adhesions below the liver and the hepatic flexure and transverse colon were released. The pylorus was patulous. There was no lesion either in the duodenum or in the stomach. The transverse colon and the great omentum were delivered and the site of the anastomosis exposed. The afferent loop was long and adherent to the wall of the stomach. This was freed and the terminal part, together with the proximal promi-

to the outer side of the right rectus will probably bespeak gall-bladder disease. Keeping the finger in contact with this point while the patient takes a deep breath will make the tenderness more pronounced, especially if the deep breath is held and the pressure of the finger increased. Palpation at this point in the presence of an enlarged gall-bladder the fundus of which projects below the border of the right lobe of the liver will reveal a swelling that moves with respiration. In the case of a diseased appendix in a high position pressure over the area will elicit tenderness, particularly if the appendix is long enough to be almost in contact with the gall-bladder. I have many times seen tenderness in this region caused by a diseased appendix mistaken for gall-bladder disease. This problem can usually be solved by palpating the appendix from below upward, when the tenderness will be made out lower down and can be traced upward, a point strongly in favor of appendical disease. But where the inflammation of the appendix is mostly at its distal end and active enough to have caused inflammation of the adjoining peritoneum and where the gall-bladder is not palpable the differential diagnosis is more difficult.

Hunger-pain if definite and occurring regularly every day three to five hours after eating and especially during the night, belongs to the symptomatology of ulcer. Sometimes however hunger-pain is present in chronic disease of the gall-bladder but it is not apt to be so constant or so marked as in the typical ulcer case. The most important points in the history of the ulcer patient are the long duration of symptoms, extending as a rule over several years, with intervals of almost if not entire freedom. This latter fact as has so often been said, argues against cure by medical treatment. These patients are many times told that they are well. It is only just, however to say that proper medical and dietary treatment, such as the Sippy treatment, will often bring relief and make the ulcer patient more comfortable. But to promise a cure of a chronic ulcer by medical measures is only a delusion. I have seen this exemplified so often that I do not hesitate to use emphatic language. It is parallel to telling a patient with appendical abscess, where the

that the toxemia from a diseased appendix may lead to ulcer. We are rather fond of this idea here in this clinic, but, as we all know toxemia may come from many other foci in the body. With this in mind is it not wise and practical to think of gastric and duodenal ulcers as "secondary diseases"? There are, of course other theories concerning the mode of formation of this disease. Suffice it to say that very probably they have a special application in special cases.

To return to the healing, if we consider ulcer a secondary disease and if toxemia and the digestive action of the gastric juice are concerned in its formation, we have a basis for treatment. That healing takes place in certain cases is probably true but we have seen so many instances in which the history indicates the presence of ulcer for many years, and in which, and this is important, there have been periods of freedom from symptoms for varying lengths of time that we must conclude there is no very good criterion to be obtained from subjective or objective symptoms that healing has really taken place. Many of the actual specimens are calloused and show connective tissue at various stages, from granulations, the youngest, to fibrous tissue, the oldest. We have seen a number of very remarkable specimens in which no effort at healing has been manifest. The ulcers have presented a punched-out appearance and the surrounding tissue showed no inflammatory reaction. We do not know just where to place this kind of ulcer. Several times Dr. Deaver has believed from finding a scar on the serous surface that an ulcer had been present, but was now healed. He has excised the scar tissue and on gross and microscopic examination we have found defects in the mucosa which were in no sense covered so that ulcer was present. The so-called hunger-pain, so frequent a symptom of ulcer is said to be very characteristic of ulcers. The question of the origin of the pain is of more than academic interest. Unfortunately too little is known at the present time either of the afferent nerves from the viscera or of pain nerves. It is good to see a systematic study of this subject such as is coming from Carlson and his associates in Chicago. Hyperacidity is often found

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Remarks by Dr. Reimann.—The subject of gastric and duodenal ulcer from the laboratory side can be approached from very many angles. Let us confine ourselves to considering only a few. In the first place Dr. Deaver has mentioned the question of the healing of these ulcers. Intimately connected with this is the question of their etiology. We all know how difficult it is to produce the typical chronic, progressive (and mark this word progressive) ulcer in animals. While gastric ulcers were known for many years, indeed, there are references to them in the late 1700's, all attempts to reproduce them in animals have failed up until quite recently. We might mention briefly a few of the methods which were used. Ligation of vessels, cauterization of the mucous membrane either with the actual cautery or with acids, or nitrate of silver and other such substances were all tried on dogs and other animals, but, and this is an important point, the wounds all healed very quickly. Indeed, about three-fourths of the vessels supplying the stomach can be tied without producing ulcers. About 1903 a typical progressive chronic ulcer was produced in a dog. The production of embolism and thrombosis had hitherto been a favorite experimental method, and while plugging the vessels with India ink or paraffin or other inert substances yielded no ulcer the addition of a toxic factor such as formalin or lead, produced the desired result. Quite recently progressive chronic ulcers have been produced in dogs which were weakened or rendered toxic by such conditions as distemper, unhygienic surroundings, etc. The sum and substance of all the experiments seem to show that given the digestive action of the gastric juice and this brings up the whole subject of autodigestion which cannot be discussed here and a toxemia, an ulcer develops. We often hear the idea expressed

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ing Even when the pylorus is completely obstructed the contents of the stomach do not simply drop into the jejunum but are sent through in irregular squirts, not as regularly or as rhythmically as through the normal pylorus. While, therefore, the movements of the stomach and its rate of emptying are not very markedly influenced by the anastomotic opera-



Fig. 5.—Marginal ulcer

tion, the chemistry is considerably changed. There is always some regurgitation of alkaline jejunal contents by which the acid in the stomach is neutralised. This does not, of course explain very clearly why gastro-enterostomy exerts a healing influence on ulcers. It seems at the present time that we must accept it as a fact and await further investigation for its explanation.

in cases of ulcer. This was known very early in Virchow's time and it was often thought that it gave rise to the pain. Experiments on individuals with fistulae, however, soon showed that this view was not correct. Moreover hyperacidity is by no means always present in ulcers nor is it increased if it is present during the pain. We know from Carlson's work that the empty stomach contracts, and that these contractions are associated with the sensation of hunger. With this idea in mind the same worker studied the contractions of the stomach during pain in ulcer. He found that the two were associated. Very recently Reynolds and McClure also found that often, but not always, pain was associated with movements of the stomach whether of hunger or of digestion. This gives us a clearer light concerning the manifestations of this pain, for whether or not it occurs and whether it be mild or severe will depend on a number of factors, namely the strength of the contractions, the situation of the ulcer that is, how close to nerve endings principally the vagus, the psychology of the patient, and so on. Dr Deever has excised the ulcer in this case and made a blind end in the stomach. This necessitates a gastro-enterostomy of course. Offhand one would say that the only indication for a gastro-enterostomy is pyloric obstruction, which is of course the major indication, but gastro-enterostomy alone even in the absence of pyloric obstruction will cause ulcers to heal. Why it does is still a mystery. That it is a fact is attested by many reports, especially of those cases in which two operations are done the first discovers an ulcer supposed to be carcinoma. A gastro-enterostomy alone is done. In several weeks another operation to resect the supposed carcinoma is undertaken when total disappearance of the ulcer is shown. At first it was supposed that the stomach emptied itself very quickly through a gastro-enterostomy and that the irritating acid and digesting pepsin were removed in that way but subsequent studies have shown that the emptying time of the stomach with gastro-enterostomy is practically normal. Furthermore when the pylorus is patulous very little contents actually escape through the artificial open

## ADENOCARCINOMA OF LEFT BREAST: RADICAL AMPUTATION WITH DISSECTION OF THE AXILLARY CONTENTS

THE Lord has given us organs of sight, taste, smell, hearing and touch, but too often we fail to use them to the best advantage in making a diagnosis. Sometimes a diagnosis can be approached by observation. Looking at the right mamma of the patient upon the table you will see the normal prominence in the center of the breast, the nipple. Now let us look at the left breast. You note there is an extra little prominence which is not present on the opposite side. The skin immediately over this little prominence is dimpled. Have you (speaking to the Intern) examined this patient?

A Yes sir

DR. DEEVER How did you examine her?

A Sight and touch.

DR. DEEVER What did your touch tell you?

A Tumor in the left breast.

DR. DEEVER What do you mean by the word 'tumor'?

A An undetermined growth.

DR. DEEVER Can be only determined by what means?

A By the naked eye together with pathologic examination

DR. DEEVER Macroscopic and microscopic. Now in your experience would you rely more upon the microscopic or the macroscopic?

A Macroscopic.

DR. DEEVER Now doctor how does that feel to you?

A Feels hard.

DR. DEEVER Contour what?

A Irregular

DR. DEEVER Movable?

A Yes.

DR. DEEVER Did the patient have any symptoms?

A No sir The tumor was not tender to the touch.



been named the ligaments of Cooper. The nipple becomes retracted through shortening of the lactiferous ducts, the latter being involved in the infiltrate. These signs are as a rule, pathognomonic of malignant growth. Doctor kindly read the history of this patient.

DR. T. Female age fifty five. Two years ago first noticed lump in the left breast, which has been slowly increasing in size without causing pain or any other symptoms. no loss in weight, no respiratory symptoms. Patient has had occasional indigestion for years never severe. no cardiac or renal symptoms.

DR. DEEVER. Is this your patient, Dr. C? Have I her consent to take off the breast?

DR. C. Yes sir.

DR. DEEVER. By both superficial and deep touch I am not able to satisfy myself that I feel any axillary glandular enlargement, but this does not mean that the glands are not enlarged, in other words that this growth has not metastasized to the axilla. I have the patient's consent to act as I think best, I will therefore do a radical operation.

The operation I employ for the radical removal of the breast is essentially Halsted's method except that I rarely resort to skin-grafting. In the great majority of cases I close the wound at once. I believe that much may be accomplished by extensive subcutaneous dissection, both lateral and medial also. In the average case there is more danger in removing too little of the deep fascia than too little of the skin which may be involved. Of course this method is not applicable to all cases, such as *cancer en cirasse* or where ulceration is extensive but with wide dissection of the skin and with the flaps made movable, the necessity for skin-grafts rarely arises and only exceptionally does necrosis of the flaps occur to prolong convalescence.

I begin the incision on the arm at a point opposite the insertion of the pectoralis major muscle at the level of the anterior edge of the deltoid and carrying it upward and inward, well on to the shoulder to a point about 2 inches beyond the line of the anterior axillary margin curving it gradually with the

DR. DEEVER In your experience what would you say this tumor is

A. Probably malignant.

DR. DEEVER What type of malignant tumor?

A. Adenocarcinoma.

DR. DEEVER I think the doctor is as near right as any of us would likely be from a gross inspection.

If this case were a young woman, who like others say to me "Doctor I want to wear a low neck, etc., I am still a young woman, then I would make an incision here under the breast in the crease between the breast and the side of the chest, lift up the breast, and dissect it out from beneath, making a scar which does not show and allowing the patient to wear a low neck. Of course it would not be nice to wear it too low but we are living in an age when fashionable women, as some one recently remarked, wear their dresses only high enough to cover and their skirts short enough to be attractive so of course we surgeons have to bear these points in mind.

I take the scissors because it answers as well as the knife. I am suspicious here but I am going to clear up the doubt. Now I will section it. I should say from the appearance and feel that it is adenocarcinoma. There was a little dimpling of the overlying skin, you recall, which with or without retraction of the nipple is usually a sign of carcinoma. I feel reasonably sure that it is not benign. I want the student body to feel this tumor I will pass it around. How is the dimpling of the skin over a breast tumor as well as retraction of the nipple to be explained, and what do they signify? Dimpling of the skin is due to shortening of the vertical septa of the fascia connecting the superficial and deep layers of the superficial fascia of the upper and anterior chest between which the mammary gland is located in other words, the mammary glands are sandwiched between these layers of fascia. These septa run between the lobules of the gland and when the lobules are infiltrated they too are infiltrated and become shortened and contracted and pull in the skin to which they are attached by the superficial layer of the superficial fascia. They have

traverse its substance and a branch of the long thoracic artery which frequently enters it near its scapular attachment. (To the assistant) Now bring the arm up and bend the elbow. I now proceed to the dissection of the axilla beginning at the apex, I cut the costocoracoid membrane near the clavicle and expose the subclavius muscle and the deep infraclavicular triangle. With gauze dissection I open the axillary sheath as near as possible to the apex of the axilla and strip it from the subclavius muscle and the axillary vessels from above downward wiping the areolar tissue and the lymphatics away from the vessels and nerves. It is important to remove every vestige of fibrous and fatty tissue especially from the upper portion of the axillary space. The branches of the axillary artery are now exposed at their origin as well as the termination of the tributaries of the axillary vein and the terminal portion of the cephalic vein. You know that the arteries here encountered from within outward are the superior thoracic, the alar thoracic, acromiothoracic, long thoracic and subscapular. The vessels except the acromiothoracic and the subscapular are ligated and cut the subscapular should, if possible, be preserved. The veins accompanying the arteries, except the cephalic vein are tied near their terminations and cut. I now remove the fascia and fat surrounding the subscapular artery and its branches. Beginning above the teres minor the dissection with gauze is carried downward, removing the fascia over the muscle, the teres major subscapularis, latissimus dorsi, and serratus magnus muscle being careful to preserve the external thoracic nerve (nerve of Bell) which runs over it in the line of the midaxilla, and also preserving the long subscapular nerve which supplies the latissimus dorsi muscle. This finishes the axillary dissection. The lower field of the operation is now exposed. Beginning with dissection of the lateral flap by deepening the incision already outlined I expose the lower serrations of the serratus magnus muscle and some of the upper serrations of the external oblique the outer half of the upper part of the sheath of the rectus abdominis. I now dissect the median flap well beyond the sternum paying no attention to the bleeding



concavity outward to within 2 inches of the upper margin of the breast this places the incision well within the line of the anterior axillary margin, so that the scar will not cross the axilla obliquely and perhaps bind the arm to the side of the chest wall. Two other incisions are made to diverge from the lower end of the one just made, the two forming an inverted V the limbs of which encircle the upper segment of the breast. The remaining portion of the incision is marked out by merely cutting through the epidermis, converging at a point about 2 inches below the lower margin of the breast, below which a single incision is carried down to a point midway between the tip of the xiphoid cartilage and the umbilicus. I now deepen the upper incision until the fascia over the pectoralis major muscle is exposed. The skin-flaps are reflected the median one being dissected well beyond the edge of the sternum upward as high as the upper border of the clavicle thus exposing the anterior portion of the deltoid muscle. The lateral flap is dissected outward and backward well beyond the anterior edge of the latissimus dorsi muscle. We now expose the axillary space by cutting the tendon of the pectoralis major close to its humeral attachment, removing this muscle *in toto*. See how the sternal fibers of the muscle recede downward and inward as the muscle is freed from its insertion on the humerus and the clavicular head continues slightly to obscure the infraclavicular region. We must now separate this portion of the muscle from its origin on the clavicle, being careful not to injure the cephalic vein. Next we expose the second layer of the anterior axillary wall consisting of the pectoralis minor muscle and the costocoracoid membrane. The index finger is pushed through the costocoracoid membrane between the pectoralis minor muscle and the craniothoracic artery close to the coracoid process of the scapula, raising the tendon of insertion of the muscle on the finger being careful to exclude the long thoracic artery which arises behind it, and the tendon is then severed with a pair of blunt scissors. Strong traction is made to lift the muscle away and the tendon of the muscle is grasped with a pair of hemostatic forceps to catch the ends which

After the wound is healed and before the patient leaves the hospital the area will be exposed to x-ray treatment, with as many subsequent treatments as in the opinion of the roentgenologist may be necessary to secure the best possible results from the operation. It is generally believed, as you all know that radiation either by x ray or radium brings about fibrosis and kills cancer cells (within reach) that may have escaped the knife. These cancer cells are in a state of division, which are more susceptible to destruction by x ray or radium than mature cells.

A word regarding tumors of the breast may not be out of place here. It is well, of course, to act on the principle that a tumor of the breast is malignant or potentially so until by frozen or microscopic section it is proved to be benign. Nevertheless there are a few points that may be of service in the clinical differentiation between benign and malignant growths. A benign tumor has a tendency to separate itself from its surrounding tissue by encapsulation, and is usually freely movable within the breast tissue. The most common type of benign growth I believe is the fibro-adenoma. There is, as a rule no abnormality of the overlying skin, such as ulceration, although this may occur as a result of pressure. Retraction of the nipple is very unusual and occurs only when the tumor is situated directly beneath the nipple. Enlargement of the lymph-glands is also rare in connection with benign growths when present it is invariably due to a complicating lymphadenitis. A benign tumor is also apt to be associated with pain in its development, and like sarcoma is characterized by rapid growth and by lobulation and cyst formation, and often by a thin glossy overlying skin and prominent veins. If for no other reason than this resemblance to a malignant neoplasm like sarcoma early removal of the tumor would be indicated, for one cannot always be absolutely sure of the diagnosis. Furthermore, simple excision of the tumor is a minor operation, practically devoid of danger while the growth if allowed to develop carries the serious menace of possible malignant transformation. The question of radical operation for benign fibro-epithelial tumors of the breast also

from the perforating branches of the internal mammary artery as these branches will again be cut when the pectoralis major muscle is removed. Grasping the breast in the left hand, I put the pectoral muscles on the stretch by downward traction, and release them from their attachments to the chest wall, and now I remove the axillary contents, the pectoral muscles, and the breast in one mass. Next I remove the fascia covering the upper serrations of the external oblique and the upper part of the anterior rectus sheath. The bleeding points are ligated with iodinized gut. I make a counterincision in the posterior flap in this way so that when the patient lies on her back the opening through which the drainage-tube is passed will be in a dependent position and just in front of the free edge of the latissimus dorsi muscle sometimes I carry the opening through the muscle. A fenestrated drainage-tube is placed in the axillary space, being careful to avoid contact with the axillary vessels and nerves, and is anchored to the skin edges of the counteropening with a single suture of silkworm-gut.

I am now ready to close the wounds, but before doing so I look for bleeding points and apply hot compresses to control the slight oozing that occurs. Some surgeons believe that drainage here is unnecessary but I find that providing a free exit for the serum and the slight oozing of blood that may collect in the axilla during the healing process reduces the danger of infection, hastens the healing process, and prevents the formation of very strong adhesions in the axilla.

The arm is now adducted and the flaps approximated with interrupted sutures of silkworm-gut, as many as are required to bring the incision edges together. The margins of the skin are sewn with interrupted sutures of fine silkworm-gut. Sterile pads are placed in the axilla in order to keep the flap of skin and superficial fascia which form the base of the armpit in contact with chest wall, and the arm is placed at an angle of about 70 degrees. The incision is covered with sterile gauze and a figure-of-8 bandage 6 inches wide and composed of 8 thick pieces of gauze is applied to include the shoulder of the affected and the axilla and the chest.

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deserves consideration, especially in patients in middle life, beyond the child-bearing period. In preparing the statistics for my book on Diseases of the Breast it was found that 24.3 per cent. of the patients traced, who had been operated upon for benign tumors of the breast, reported postoperative complications at more or less remote periods, consisting either of a similar growth in a different part of the same breast or in the other breast. This certainly seems to indicate the susceptibility of certain breasts to tumor formation.

Bleeding from the nipple in the presence of a tumor is generally regarded as a sign of malignancy although so eminent an authority as Bloodgood, I believe, disagrees with this view. But in my experience a discharge from the nipple, particularly a bloody one is rarely associated with a benign tumor. It nearly always indicates a somewhat rare tumor known as intracystic papilloma, which is classed among the benign tumors, but has a pronounced tendency to malignant transformation. I am inclined to think that in most cases the growth is malignant from the onset. At any rate, it is advisable when operating for this condition to determine the presence or absence of malignancy before deciding upon the type of operation.

Remarks by Dr. Reimann.—To jump from this concrete case of carcinoma of the breast to a more general theme let me make a few remarks in reference to co-operation in tumor study. I shall only say a few words, but give you impressions which we receive here almost daily. It will be admitted by all that pathologic anatomy is a fundamental subject, and there will be no hesitation in agreeing with another general statement, namely that proficiency cannot be attained in this branch except as a result of years of practice and experience. Pathologic anatomy is an art as well as a science and the judgment of the pathologist is a combination of the art as he has acquired it plus the science behind it. The general subject has been worked over very carefully and thoroughly but no doubt all surgeons and all pathologists who co-operate with surgeons know that there are wide gaps in one most important phase and that is correlation of the patient with his tumor. Path-

ologists receive specimens, tissue, and sometimes even bits of tissue with the request for diagnosis. Often there is no word or very little of the clinical aspects of the patient from whom the specimen was removed and still less information is given concerning the future course of events in that patient. Therein lies a gap in our knowledge. The pathologist, Ewing of New York is helping to supply knowledge in that direction the surgeon and pathologist, Bloodgood, of Baltimore, is working along the same lines only to mention two although if we hunted, we would find it hard to increase the list to any considerable degree. Carcinomata, to return to the specific tumors of the breast, usually fall into certain well-known classifications. When they are hard and fibrous they are called scirrhus those that are less hard are known as simplex and the soft ones are called medullary carcinomata. Microscopically the cells may arise from the ducts or the acini they may form "adeno" structures, or they may grow diffusely or there may be combinations of both furthermore the axillary lymph-nodes, when they are involved, may show varied structures in the respective individual nodes. We have patients with large tumors and very small metastases in the axillary lymph-nodes while the reverse also occurs. We have followed patients whom we expected to die very quickly for years after the operation others were expected to live long or to be entirely cured of the disease, and we were disappointed. We would obtain more knowledge of the factors involved through a correlated study of let us say the position of tumors, duration, size degree of axillary involvement, the gross and microscopic picture, and finally the follow-up history to mention only several of the more obvious considerations. This has been done to a certain extent, but how incompletely is only apparent in a study of the general literature.

This talk has become, as you see a plea for closer co-operation between surgeons and surgical pathologists, but while we are on the subject of the breast it will be useful to call attention to the admirable piece of work done by McFarland, of the University of Pennsylvania. This was presented at the Phila

delphia meeting of the American College of Surgeons last fall, and will be published very shortly. Among other things he speaks of chronic cystic mastitis, the disease very frequently looked upon as one of the precursors of malignancy. According to his work there is no such thing as chronic cystic mastitis, since there is no inflammation present. It is a cystic disturbance of the breast traceable to modifications of involution. It is not necessary that lactation be absolutely established for changes to take place in the breast. Indeed, he says, they even take place with the onset of pregnancy. When the call upon the breast function ceases it undergoes an involution, but there are areas which fail to reach the final stage. The least objectionable of the terms, according to McFarland, is "abnormal involution," as suggested by Warren many years ago. The objection to this term is to determine when it is abnormal because *so many different appearances are presented*. This most important work should be studied by all who deal with conditions in the mammary glands.

## TRANSPERITONEAL HYSTEROTOMY

THE next patient I present is one of pregnancy of seven and a half months duration in which the symptoms indicate a hysterotomy. They consist of pyelitis, persistent vomiting, headache low blood-pressure very high blood urea, and low phenolphthalein output. urinalysis shows a low specific gravity and the presence of albumin pus, casts etc. in other words, a type of the toxemia of pregnancy. The pregnancy in fact, is almost far enough advanced to call the operation a cesarean section. When I first saw this patient with the medical chief and the house doctors we hoped it might be possible to tide her over until the eighth month in order to save the child if possible but conditions seemed to demand operation now. The case being one of pyelitis we will do it under nitrous oxid and oxygen anesthesia. From the surgeon's point of view ether chloroform, or intraspinal anesthesia would be preferable because the patient is more relaxed and permits greater ease of manipulation. The condition of the kidneys make chloroform or ether objectionable, while the low blood-pressure makes intraspinal anesthesia, particularly with stovain, too dangerous. The latter even under so-called favorable conditions is dangerous enough. Novocain solution, which I understand is now being given in the Mayo Clinic, is considered safer than stovain for intraspinal anesthesia. I will use the transperitoneal route, discussing the value of the operation and its indications when I have finished.

With the patient in the Trendelenburg position I make the incision, carrying it over and through the right rectus muscle, expose the transversalis fascia pick it up with the peritoneum and cut it, thus opening the peritoneal cavity the incision is now enlarged enough to allow delivery of the uterus upon the abdominal wall. Before attempting to deliver the uterus and introducing the retractors we will cover the abdominal wall



adjacent to the wound with warm gauze pads to prevent contact of the uterus with the skin. Two retractors are now placed in the wound, the one in the lower end the other in the side of the wound and as the assistant makes traction downward, upward and outward, I deliver the uterus, packing gauze around it to prevent any fluid getting into the peritoneal cavity. With great care and gentleness I now carry an incision through the wall of the uterus down to the membrane making it large enough so that by compression upon the sides of the uterus the fetus can be delivered with the membranes intact. This I consider the way ideal, the mother practically is not being exposed to any chance of infection of the peritoneum. I have always considered emptying the uterus within the abdominal cavity poor surgery. I now close the wound in the uterus in layers by a continuous chromic catgut suture up to the serosa, but not carrying the stitches into the cavity of the uterus. The wound in the serosa is closed by interrupted linen or fine silk sutures. Usually it is not necessary to clamp and tie bleeding vessels in the uterine wall because contraction of the uterus and the sutures control the bleeding, but occasionally it may have to be done. The uterus is returned to the abdominal cavity, the appendix taken out if it has not already been removed, and the wound closed.

Transperitoneal hysterotomy is one of the most satisfactory as well as successful operations we perform. I have done it about one hundred and fifteen times without a fatality or any postoperative morbidity. In closing the superficial portion of the uterine wound I use the Lambert stitch and introduce the needle threaded with linen or with silk at a distance from the center of the wound so that enough of the superficial portion of the uterine wall fills the wound which when the stitch is tied will act as a compress, and thus control any oozing that might otherwise take place. In other words the deeper the superficial wound the more of the uterine wall will be inverted. The idea is the same as in a gastro-enterostomy where the last stitch is carried along the anterior margin of the anastomosis thus making two rows of suture stitches in this margin which

answers the same purpose in controlling bleeding as three rows placed in the posterior margin.

You may ask why I do not use catgut sutures in closing the uterine wound. Catgut, first of all does not absorb so easily and is more likely to break than linen or silk second, we cannot be as absolutely sure of catgut as of linen or silk. In closing the abdominal wound also I would advise you always to use silk, linen, or silkworm in addition to catgut sutures if you wish to avoid such unpleasant sequelae as postoperative dismemberment.

Some surgeons, particularly obstetricians and gynecologists, prefer to do a vaginal hysterotomy or a so-called extraperitoneal abdominal operation. But in this clinic, especially in the absence of a septic condition of the uterus, we do not use these routes, since we do not consider them ideal surgery.

I consider transperitoneal hysterotomy a very valuable operation. I know that I have been accused of using it when other simpler and, perhaps to the inexperienced surgeon, less dangerous methods might do just as well. We are all human and liable to err but I can do only what my judgment tells me is best. My results I believe bear me out. I may add, however that I would not advocate the use of this operation except by the experienced surgeon.

In the non-pregnant uterus transperitoneal hysterotomy is useful in clearing up doubtful cases especially of bleeding where no definite cause for the same can be made out, and which I believe can be better diagnosed by direct inspection than in any other way. I know that the general rule is to treat such cases with radium. While radium does arrest the bleeding it does not fathom its cause. Furthermore there is a certain degree of danger in its use which is not always admitted by its unequivocal advocates. I have seen severe peritonitis not due to any inflammatory condition of the appendages result from the use of radium, while the development of fistulae is another morbid condition that may follow its application.

In the pregnant woman we do a transperitoneal operation for placenta previa accidental separation of the placenta,

prolapse of the cord, eclampsia, toxemia with nephritis, and in certain cases of pulmonary tuberculosis where the pregnancy is beyond the fourth month. Before the fourth month, however dilatation and curetage and the introduction of a catheter would be indicated but even in these cases accidents, such as perforation of the uterus and infection, may occur which would not follow a clean and skillful hysterotomy

(Mother and child left the hospital in good condition three weeks after the operation.)

## RECURRENT CHOLECYSTITIS; CHOLECYSTECTOMY

THE patient I will now present has already had her gall-bladder drained, but not at this clinic. The question before us now is Why is she here this afternoon, what is the matter with her and what are we going to do. Let us read the history. Female aged twenty nine chief complaint, pain in abdomen. Two and a half years ago the patient was operated upon in another hospital stones were removed from the gall bladder and the organ drained not removed. She was free from symptoms until two months ago when she began to have attacks similar to those prior to the operation. These attacks come on suddenly three or four times a week, and consist of pain in the epigastrium and beneath the right costal margin, radiating through to the back nausea, but no vomiting. Last attack, two days ago was relieved by hypodermic of morphin. No definite jaundice has had a feeling of heaviness in the epigastrium, also bloating and considerable belching of gas after meals occasional hunger-pain relieved by eating. Bowels constipated. This certainly looks like a case of recurrent cholecystic disease. In our examination of the patient we have not been able to palpate the fundus as frequently can be done in the presence of an enlarged gall-bladder this, however does not contraindicate an enlargement with or without stones any more than does the absence of jaundice. We have been able by delicate palpation to detect slight rigidity as well as elicit slight tenderness over the position of the gall-bladder most pronounced when the patient takes a deep breath and holds it, at which time tenderness of the liver immediately overlying the gall-bladder is also evident to a slight degree. We have not by deep pressure over the lower anterior chest been able to make out any general liver tenderness, as we frequently can in many cases of cholecystic disease. In this connection I may say to you that it is now being generally recognised that

most cases of interstitial cholecystitis are associated with or develop from hepatitis, the infection being carried to the walls of the gall bladder by the lymphatics of the liver which communicate with the lymphatics of the gall-bladder. Dr Stanley P. Reimann, our pathologist since 1917 has been reporting to this clinic the presence of chronic hepatitis in pieces of liver frequently removed with the gall-bladder in cases of chronic cholecystitis. The next most common avenue by which infection reaches the gall-bladder walls is through the blood. In fact the lymphatics and the blood-streams are practically the only avenues by which organisms are transmitted to the wall of the gall-bladder. Descending infection from the liver by bacteria carried down in the bile and ascending infection from the duodenum up the common duct are now seldom thought to play a rôle in the causation of chronic inflammation of the gall-bladder. The wall of the gall-bladder is occasionally but rarely infected from an inflamed contiguous organ. I have seen such infection take place from an appendix in contact with the gall-bladder. The first instance of this kind occurred in my experience several years ago in the person of the wife of a colleague. I was asked to operate. The husband's diagnosis was suppurative appendicitis in a high-lying appendix, but operation revealed the two conditions appendicitis and cholecystitis. This subject of cholecystic infection has been most intelligently and convincingly discussed by Drs. Graham and Peterman of St. Louis. Their conclusions are supported by clinical study as well as by experimentation. I would urge those of you who are especially interested in this subject to familiarize yourselves with the splendid work of these investigators. Their results justify the statement I have already made this afternoon when I referred to the irrational treatment of cholecystic disease by duodenal flushings with Epsom salts solution. If time permitted I should like to talk to you further along these lines but there is too much work awaiting us to allow me that pleasure now.

In answer then, to the question "What is the matter with the patient?" we can say definitely interstitial cholecystitis with

adhesions, the characteristic symptoms being the feeling of bloating distention of the stomach with gas and occasional hunger-pains, the presence of adhesions about the stomach and duodenum. Let me here say that in the absence of very definite history of gall-stone colic with pain referred to the costal margin and to the right shoulder blade, requiring morphin for relief and in the presence of the other symptoms such as described above such patients are not frequently sent to us with the diagnosis of duodenal ulcer. I am not always surprised at this diagnosis because the presence of adhesions arranged in the shape of comparatively broad bands (pathologic sheets of fascia) attached to the duodenum oftentimes cause ulcer symptoms, and barring positive x ray findings it is difficult to make a differential diagnosis.

We will now proceed with the operation. The patient is placed with a round sand pillow beneath the lower dorsal vertebra. This elevates the lower chest and the upper abdomen, brings the liver in a high position so that when the abdomen is opened the structures to be dealt with are more accessible than when the patient lies flat on the table. The size of the sand pillow depends upon the size of the patient. This patient having been operated upon before I will cut out the scar and go into the abdomen through the route employed by the previous operator. My usual incision is a vertical one through the rectus muscle. I have never used the transverse incision as practiced by many surgeons as I have always been able to get a good exposure and to work with ease and safety by the vertical route. In my experience the simpler the operative method, the better the result. This also applies to our armamentarium namely as few instruments as possible. That upon which I lay great stress is the skilful disposition of moist gauze pads not towels, to keep the structures other than those to be attacked out of the way. The abdomen opened I pass my finger down to the right iliac fossa, bring up the cecum and deliver the appendix in the manner familiar to those of you who frequent this clinic, and already described this afternoon. We are not always able to do this without either enlarging the incision or making

a separate one over the position of the appendix. When the rectum does not lift up easily so that the technic of the removal cannot be carried out in the open, which means safety it is better to make a second wound as two comparatively small wounds are better than one large one. When I do take out the appendix through a second wound I decidedly prefer the McBurney incision. The most important part of the technic after the removal of the appendix is the handling of the stump. I am sure many patients lives have been sacrificed by faulty technic at this stage of the operation. I have had this forcibly brought to my mind upon more than one occasion. To illustrate. Recently I was asked by a colleague to see a patient upon whom he had operated three days before for gall-stones, at which time he removed the appendix through the wound over the gall-bladder. I found the patient hopelessly ill from the toxemia of a diffused peritonitis. My colleague said to me he had attributed the peritonitis to faulty technic in the removal of the appendix which made him much dissatisfied with the operation. He furthermore remarked that he would never do this again.

When making two operations upon the same patient perform the larger of the two first. You will then be better able to judge of the capability of the patient to withstand the second. To illustrate the force of this statement I recall an instance of three operations having been made on a patient with a triple crush, the forearm and leg on one side and the thigh upon the other. The surgeon amputated the forearm first, then the leg, and last the thigh. When having finished the thigh amputation the patient died. This shows you the value of experience and judgment. I frequently say to the students, next in importance to the information derived from reading and listening to lectures is the opportunity to apply this information in the hospital wards during their internship. This gives them experience, and with experience together with knowledge properly used they may acquire wisdom.

With the abdomen opened we first determine what can be learned by careful inspection next locate the site of the lesion,

and place a small piece of moist gauze in the wound to cover the structures seen we then introduce retractors, making gentle traction preparatory to introducing the moist gauze pads. I have now clearly exposed to your view the lower portion of the right lobe of the liver and the suspensory ligament of the liver a portion of the gall-bladder extensive adhesions, and what I make out to be the pylorus, the duodenum the hepatic flexure of the colon and great omentum, which to you I dare say looks like a conglomerated mass. The picture presents some of the pathologic possibilities of an infection of the upper right abdomen. This part of the abdominal cavity is capable of concealing numerous secrets too often only to be revealed by a master stroke with the aseptic scalpel. There is no other way that I know of of making the abdominal walls transparent. Some have tried to do this by injecting air into the peritoneal cavity but as I view it the latter is a much less certain and much more dangerous procedure than is operation by the experienced surgeon. What is more illuminating fascinating and inspiring than opening up to the light of day the true condition and thus dispelling doubt and revealing truth, too often the only way of solving the riddle. The flash-light can never take the place of the search-light. Therefore it has been well said that the medical man walks by faith only the surgeon walks by light and faith.

The next step in this operation is to separate the adhesions in order to expose the lesion. Adhesions serve both a protective and destructive purpose. Doubtless in this instance the adhesions you here see were first protective, that is, by binding these structures together they protected the surrounding portion of the peritoneum against bacterial invasion. But now you must agree with me they are harmful in the sense that they handicap the movements of the viscera which they embrace. In other words, they cannot perform their normal physiologic functions due to pain in the shape of pylorospasm, regurgitation, distention after eating constipation, etc. and which medicines have failed to relieve. As I release these adhesions I note the deformity of the particular organs to which they are attached, the pylorus



and the duodenum which in the latter is so pronounced as to make a prominent duodenal cap. Note the irritability of the pyloric antrum, how its musculature rises up in bundles when I strike it lightly with the handle of the scalpel or with the scissors. Is this condition of affairs not enough to cause melancholia in the individual who is not too strong of mind and drive him to Christian Science osteopathic, chiropractic treatment, and a host of other "isms" of a like kind? Let me cut one of the longer and broader of these adhesions, and place it in a basin of water which is the best way to demonstrate large-sized adhesions. With the hepatic flexure anchored to the liver the gall-bladder and the suspensory ligament, and the great omentum adherent to the viscera normally occupying this region, it is easy to understand why this patient was constipated. I could discourse at length upon the destructive effects of adhesions, to say nothing of acute intestinal obstruction which they may cause, the mortality of which is 50 per cent. Adhesions that cripple the duodenum are capable of causing a train of symptoms which often lead to a diagnosis of duodenal ulcer. Only by opening and seeing can the diagnosis be made with certainty. Sometimes it can be made with the x ray but this diagnosis is often doubtful. Operation removes the doubt.

To proceed with the operation, there is no trouble in recognizing an interstitial cholecystitis. The liver immediately over the gall-bladder is streaked with white lines, indicative of chronic hepatitis at this point which with cholangitis, will no doubt be shown in the microscopic study of the specimen. You will also note that the portion of the gall-bladder adjacent to the cystic duct is adherent to the free border of the gastrohepatic or lesser omentum, which we must separate in order to examine the common duct, and also to see whether there are any enlarged lymphatic glands other than the gland lying at the junction of the common duct and duodenum which you see is of considerable size. I examine the head and body of the pancreas, look for enlarged lymphatic glands about the head of the pancreas, then put my finger into the foramen of Winslow and palpate the common duct. I am unable to find any evidence

of other inflammation except that of the gall-bladder. I will next take out the gall-bladder from below upward, as is my usual practice, although occasionally I remove it from above downward. Through traction on the liver and the gall bladder in the absence of adhesions between the liver and the diaphragm, and by pulling the liver and the gall-bladder downward outward and upward, the free border of the gastrohepatic omentum is made taut, which in turn stretches the cystic duct. I now incise the omentum high up and by careful dissection bring the cystic duct into view. This duct is clamped by two long hemostatic forceps and cut between with the canterly knife, a small piece of moist gauze being placed beneath the free border of the omentum. Next the cystic artery is exposed, clamped and cut when the gall bladder is dissected from below upward, avoiding as far as possible going into the liver substance. The cystic duct and cystic artery are tied separately by chromic catgut ligatures.

The gall-bladder bed is closed by carrying a continuous iodine catgut suture on a long curved needle around the bed. This not only closes the bed, but arrests oozing and necessitates less drainage than would otherwise be required. A small rubber tube is carried down to the stump of the cystic duct, and in some instances a part of the free portion of the great omentum is interposed between the bed of the gall bladder, the pylorus, and the duodenum, the object being to prevent contact and consequent adhesions to the liver at the site of the line of the suture which closes the gall-bladder bed. The wound is closed with through-and-through sutures of silkworm gut and layer sutures of iodine catgut, and the skin is closed with silkworm-gut of small size. In placing the drainage-tube it is important not to carry it beyond the free margin of the gastrohepatic omentum. If carried beyond this point it may come in contact with the diaphragm and cause the patient to have a dry cough which is at once relieved by slightly withdrawing the tube. It is my practice always to use drainage. Where it has not been used I have seen patients die from extravasation of bile into the peritoneum, a condition, however, if recognized

is nearly always successfully treated by prompt operation. It may sound well not to use drainage and the patient may be more comfortable without it, but in a certain percentage of cases it results in disastrous adhesions, constituting one of the unpleasant sequelæ of cholecystectomy. Cases of this sort often require reoperation of a more or less extensive nature, such as separating the stomach and the duodenum and interposing a portion of the great omentum (as described above) between the liver the stomach, and the duodenum, with permanent relief of symptoms or a posterior gastro-enterostomy as in cases where the viscera are so firmly fastened together that to attempt to free them would expose them to the risk of being torn. I have seen these structures—the stomach, duodenum and the under surface of the liver—so firmly bound together that they could be no better described than by the German word *eingemauret* "masonried in." I could relate a number of such instances that are still fresh in my mind, but just this one case will serve the purpose. A young woman, six months after a cholecystectomy developed all the symptoms of practically complete obstruction of the pylorus for the relief of which she was obliged habitually to use the stomach-tube and in seeking relief she came to know all the prominent stomach specialists in the country. Finally after much deliberation and procrastination, she agreed to my making a posterior gastrojejunostomy with complete relief, and now six years after the operation, she is still entirely well. These with other sequelæ of operations come under the heading of the trials the tribulations the disappointments and the joys of the surgeon.

The after-treatment of these cases is usually simple consisting chiefly of careful nursing, and restricted diet for at least one year after operation.

While the majority of patients are relieved after operation for disease of the gall-bladder symptoms recur in about 8 per cent. of the cases. Of course this happens more frequently after drainage of the gall-bladder than after its complete removal. In draining the gall-bladder by a cholecystostomy it may happen that stones are left in the cystic duct or when

the common duct has been involved in the original operation stones may reform in the papilla of Vater or in the hepatic duct or its radicles. Operation for the removal must include exploration of the main hepatic duct as well as its primary branches. This is best done by passing sounds of graduated sizes or by means of the scoop. No operation for the removal of calculus obstruction of the common duct should be considered complete without thorough exploration of the duct, including passing of a medium-sized probe through the papilla of Vater until the end of the instrument can be felt in the duodenum. This, however must be carefully and gently done in order to avoid puncturing the wall of the duct. Sometimes a stone in the common duct will cause almost complete occlusion of the opening of the duct into the duodenum amounting practically to an annular stricture. This, no doubt, results from inflammation of the duct—choledochitis—incited by infection plus the presence of the stone. The opening should be restored preferably by gradual dilatation in order to relieve jaundice.

In attempting to remove stone or stones from the hepatic duct care must be exercised not to push the stones upward where it may be impossible to reach them. Sometimes a stone that has been pushed up in this way or one that may have escaped detection at the original operation owing to its high location may later find its way downward and cause the return of symptoms. Other causes for the recurrence of symptoms after operation are adhesions which are more likely to cause trouble after cholecystectomy than after cholecystostomy—reinfection of the biliary passages, and lastly a latent hepatitis and cholangitis may produce a return of symptoms from two to ten or more years after the primary operation of the gall bladder. This requires rather prolonged drainage of the common duct for relief. Very often, too a subsequent pancreatic lymphangitis or pancreatitis plays a part in the reappearance of symptoms after operation for disease of the gall-bladder.

Remarks by Dr. Reimann.—There is much to be learned of the gall bladder and the bile passages not only regarding their

pathologic physiology but their normal every-day physiology as well. The most obvious function of the gall-bladder is that of a reservoir from which bile can be sent down into the duodenum as occasion demands. Observe that I said "sent down" and not "forced down" or "squirited down" or any other word suggesting force. The gall-bladder has muscle in its wall, but only a very little. It is *assumed* by some that this muscle contracts and forces the contents of the gall-bladder outward. The contractile property of the gall-bladder has been examined a number of times from the day of Doyon down to the present time. We ourselves have also examined the contractile function of this organ. I will mention just a few of the methods which have been used in this work, but will anticipate by saying that if the gall-bladder does contract, the force which it can exert has never been demonstrated to be greater than the secretory pressure under which bile flows down from the liver. Balloons have been placed in the gall-bladder through incisions or up through the common duct. Threads have been applied and connected to levers. Oncometers have been adjusted stimuli, electrical, chemical, and mechanical, have been applied directly indirectly and through its nervous supply. It has been excised, and strips of the whole organ suspended between levers in suitable oxygenated solutions. The latter method has demonstrated a slow and deliberate change representative of ordinary smooth muscle tonicity. The objection that an anesthetic is used may be of some importance but all surgeons and experimentalists know and have seen that the intestines do not lie motionless in the abdominal cavity under suitable conditions even in an anesthetized animal or the human subject. Why should the gall-bladder be different? But the strongest argument against any noteworthy contractile power of the gall-bladder which we can deduce is that we have never seen, and as far as we know there has never been reported, a hypertrophied muscular coat in the organ in spite of the fact that we have had numerous cases with stones impacted in the cystic duct others certainly have had the same experience. Other smooth muscle structures with different contractile power still a

different story. We cannot help believing that what contractile power the gall-bladder has is very small.

Coupled with its property as a reservoir is the one so obvious, viz. its concentrating ability. Quite recently through the work of Rous and McMaster this function has been studied quantitatively. Briefly the gall bladder concentrates the bile while the ducts tend to dilute it. This latter remark is made because there are certain closely related species of animals some of which possess gall-bladders and some of which do not. The question arises Does any other structure in animals without a gall-bladder concentrate the bile? Which again brings up another question, Is concentrated bile more useful in digestion than unconcentrated bile? The first of these questions has recently been answered by McMaster in the *Journal of Experimental Medicine* where the other publications also appeared. Gall-bladderless animals at least the rat, have no structure which corresponds to that function of the gall-bladder. He points out that it is interesting but of course at present we cannot evaluate the significance of the fact, that the bile of the rat which is not concentrated by any organ contains eight times as much pigment as does the liver bile of the mouse which has a gall-bladder. The further significance of this must be left to the future. The next question is this Does the gall bladder concentrate bile by withdrawing fluid through its lymphatics or directly into its blood supply? I know of no answer to this point, but returning to the question of the gall bladder as a reservoir and as a concentrating organ, we find that animals without gall-bladders also have a muscle at the end of the common duct, namely the sphincter of Oddi. Mann in the *Journal of Laboratory and Clinical Medicine* (1920) says that the tone of this sphincter is very low in the rat in contradistinction to that in animals possessing gall-bladders. When the gall-bladder is removed it is well known that the ducts dilate and it is said after a time dilatation and high pressure overcome the sphincter of Oddi, and bile flows into the intestine more or less continuously. Further than that we cannot go that is, we can say little further in regard to any

effects of this on the metabolism in general. It is interesting to remember that if a stump of the cystic duct is left behind after cholecystectomy a sort of pseudogall-bladder develops at any rate it is a dilatation and we wonder whether this little dilated sac develops concentrating abilities, and if so whether the cystic duct did not have it in the first place.

This subject could be enlarged upon at considerable length, but I must hasten to the pathology. Starting with the well-known clinical observation that a gall-bladder which has once given trouble is likely to continue to do so what pathologic facts have we to explain it? In the first place, a large majority of diseased gall-bladders show pathologic changes not limited to the mucosa, but extending outward into the wall and to the serosa. They consist of the ordinary evidences of acute or chronic inflammation namely edema, congestion, pus-cells, fibrin lymphocytes, and fibrosis as the case may be. This penetration of the walls is furthermore shown to be related to the presence of bacteria therein. Rosenow has shown it others have found the same thing. When we remember the well-known ability of streptococci and other organisms to remain latent for a length of time, we can see why exacerbations will occur. We can also see why there should be adhesions in the neighborhood. We can see why pathologic changes are found in bits of liver tissue removed at operation, and this brings up another question. We have found as, of course, many others have, that the longer the delay in removing the focus of infection, that is, the gall-bladder the less likely is the patient to return to complete health. We wonder just how big a part this infection of the liver plays in the subsequent history of the patient. This means more work, of course, particularly necropsy observations.

## RENAL CALCULUS—PYELOTOMY

DR. T will please read the history of the next patient.

Male aged twenty two years. Three years ago had an attack of pain in the right kidney region which lasted about one week. Since then similar attacks have recurred about every two weeks. The pain, more or less severe starts in the right lumbar region, radiates downward toward the bladder and sometimes to the left side purgation relieves the pain. About four weeks ago the patient passed a stone which resembled two grape-seeds pressed together. Urination is accompanied by a burning sensation. Microscopic examination of the urine shows red blood-cells, pus, mucus, and many epithelial cells. The blood count is normal urea percentage normal phenolphthalein elimination 60 per cent. in three hours amount of urine in twenty four hours normal. Cystoscopic examination Bladder normal both ureteral orifices normal, ureters open throughout left kidney functional activity good right activity poor elimination of indigocarmine being delayed fifteen minutes. Urine from right kidney shows heavy trace of albumin few leukocytes, many epithelial cells no organisms present. Urine from left kidney normal.

Cystoscopic examination is important if for no other reason than to determine the presence of both kidneys. The x-ray picture shows a small shadow in the pelvis of the ureter clearly seen in the illuminated plate. The x-ray plate in this case—where the stone is one that casts a shadow—not only clinches the diagnosis, but is of value in giving some idea of the location of the stone. But, as you all know not all types of stone can be detected by x-ray. In such instances we must rely on our other means of diagnosis in order to differentiate the condition from others which often resemble the symptomatology of calculi. The most common conditions in this respect are pyelitis, tuberculosis, early tumor formation, movable kidney causing a sudden twist of the ureter



We are fortunate in having diagnostic aids at our disposal. But it often occurs to me whether with these mechanical methods we are not losing some of the acumen possessed by our predecessors of about thirty years ago. In a case of this kind, for example, they would have had only the history the physical examination and the urinalysis to depend upon for a differential diagnosis. In this connection I would like to call your attention to an address recently delivered by Dr. Alfred Stengel before the Virginia State Medical Society. He draws a comparison between the diagnosticians of today and those of the generation preceding ours, who with nothing but their brains, fingers, and their God-given senses developed to the utmost, probably were better diagnosticians than we are turning out today in spite of or perhaps because of the mechanical means at our command.

In making the differential diagnosis it is well to remember that pyelitis gives constitutional symptoms, fever general malaise with local tenderness and rigidity frequency of urination and pyuria. Cystoscopy if permissible, will materially assist in making the diagnosis, and an x ray study should also be made. Incidentally let me caution you not to mistake pyelitis for appendicitis, an error that may occur a possibility that should be borne in mind, particularly when the patient is a pregnant woman.

A kidney condition with a history of frequency and of burning urination, in the absence of acute urethritis is suggestive of tuberculosis. Here, fortunately the pointing and dimpling of the ureteral orifice as seen in the cystoscopic picture is practically pathognomonic. In early renal tuberculosis local tenderness and muscular rigidity are absent when present these signs indicate an advanced pathologic process probably with abscess in the kidney and ulceration of the bladder and possibly also involvement of the opposite kidney. Early tuberculosis, however is usually unilateral, so that prompt recognition and prompt removal of the affected organ offer good prospects for a cure.

In its early stage tumor formation in the kidney the most

common type of which is hypernephroma causes blood to appear in the urine. As the blood-clots in the renal pelvis or the ureter pass downward they cause pain similar to that of renal colic due to stone. As the tumor enlarges the kidney becomes palpable. The absence of pain and of hematuria make cystoscopic examination imperative in order to determine which of the two kidneys is causing the trouble. In advanced cases there is the cachexia and anemia associated with neoplasms elsewhere in the body. In some instances x-ray shows enlargement of the kidney as well as tuberculous foci.

Pain like that produced by renal calculus may also be associated with a very freely movable kidney. I have seen instances of this kind where the lesion was demonstrated by careful physical examination and in which a nephropexy restored the organ to its original position with complete relief of symptoms. This condition should be thought of before arriving at a definite diagnosis.

A perplexing condition in making a differential diagnosis from early tumor formation, and one which has not as yet been clearly explained, is so-called essential hematuria. The chief point is that, as a rule the condition is symptomless except for the appearance of blood in the urine. Every known means of diagnosis must be used in such cases: microscopic, chemical, and bacteriologic study of the urine; Wassermann tests; cystoscopy; ureteral catheterization; pyelography; x-ray and, of course, careful history and observation of the patient.

The patient being now ready we will proceed with the operation. You will note that the patient lies on the side opposite to the one to be operated upon with the legs flexed against the thighs and the thighs upon the abdomen; a sand pillow is placed under the loin thus raising the operative field. An assistant standing opposite the operator pushes the flexed leg and thigh toward the operator thus widening the ilio-costal space, making the soft parts more tense and more prominent, and facilitating the operation. The arm and forearm are held and manipulated in the same way as the leg and the thigh, thus making breathing less embarrassed. The surface landmarks are the crest of the

flum, the lower chest margin, the spinal furrow with the longitudinal prominence produced on each side by the erector spinae muscle and to either side of the furrow a slight depression corresponding to the site of the lumbar aponeurosis covered by the latissimus dorsi and the external oblique muscles.

A vertical incision, with its lower end directed forward, is carried through the skin over the lumbar aponeurosis, then through the superficial and the deep fascia, exposing the posterior border of the external oblique muscle, the fibers of which are separated in the line of the incision exposing the lumbar fascia or lumbar aponeurosis. The aponeurosis is incised in the line of the wound, when the perirenal fat above and the retrocolic fat below are seen. I grasp the perirenal fat, consisting of the two superficial fatty layers and the deep membranous layer with two hemostatic forceps and incise the superficial fatty layer enlarging the incision enough to expose the kidney enveloped within the true capsule and surrounded by the membranous layer of the fatty capsule. The membranous layer is next incised and the two halves of this capsule are separated from the true renal capsule the kidney is then delivered the pelvis of the ureter is now exposed and carefully palpated. I detect a small hard body within the pelvis of the ureter which I take to be a stone. I now incise the pelvis and deliver the stone at the point shown on the x ray plate. I close the wound in the pelvis with fine chromic catgut sutures, replace the kidney in its normal position, and introduce a small rubber drainage tube to the site of the wound in the pelvis. I next bring the reflected halves of the fatty capsule over the kidney and appose them with iodine catgut sutures. Before closing the abdominal wound I will separate the retrocolic fat and expose the peritoneum, deliver the cecum, and remove the appendix. Were this septic kidney I would not remove the appendix. The wound in the abdominal wall can now be closed with layer sutures of iodine catgut, and dressed in the usual manner.

Incising and removing a foreign body in this case stone, from the pelvis is known as a pyelotomy while incising the

kidney and delivering a stone is a nephrotomy. The former is the preferable operation when it is feasible. The incision into the pelvis can be made large enough to admit the end of the finger and thus permit exploration of the calices. If a stone is present it can be removed with a curved forceps without incising the kidney. Nephrotomy is attended by the loss of considerable blood. This, however, can be prevented by placing two or more small moist gauze sponges into the wound directly over the renal vessels, held in position by the convex end of a retractor by means of which enough pressure can be made to make the incision into the kidney when the stone can be delivered without loss of blood. The wound in the kidney is closed by deep and superficial iodine catgut sutures. This method has proved most satisfactory in our clinic.

Remarks by Dr. Reimann.—In general, calculus formation in the body is a problem in colloid chemistry. This applies particularly to urinary calculi. The urine is not simply a salt solution, but it contains, in addition, various colloids. Putting the proposition into the language of colloid chemistry—a salt solution is suspended in the spaces of a more or less connected scaffolding which consists of a very diluted jelly" (Schade). As a salt solution urine is supersaturated that is, it contains more salts than a corresponding amount of water could dissolve. Even larger quantities of crystalloids may be suspended or even dissolved in urine. Thus Haskins has found that urines that are slightly acid and all that are neutral or alkaline can take up extra uric acid when this substance is shaken up in them. Some dissolve so much that they contain more of the substance than is present in a saturated solution of monosodium urate. He remarks that at least part of this uric acid is in colloidal solution. We know that there are diseases in which the secretion of uric acid is markedly increased e. g. leukemia, without calculous formation. Precipitation does not take place until "the stability of this system is disturbed. Schade succeeded in producing laminated calculi experimentally by using the irreversible colloid, fibrin. In inflammations fibrin is present and it may be that inflamma

tion is a factor favoring the formation of calculi although of course, there are many more cases of inflammation of the urinary tract without calculi than with them. There must apparently be particular circumstances in the inflammation which causes this precipitation of the colloids and crystalloids. The feeding of oxamide is known to be followed experimentally by calculi. The mechanism of this is unknown. Osborne, Mendel and Ferry report the impressive statistical fact that in every rat which they had fed in their experiments on diets with food deficient in fat-soluble vitamin, there were discovered phosphatic calculi. The significance of this awaits further investigation. You will see even in these few words that there is nothing very definite known of the mechanisms of the formation of calculi. Only hints here and there are given. In the practical management of such cases it is always the sequelae of calculi and not the calculi themselves that demand treatment. There are many interesting details for discussion and we must necessarily limit ourselves to only a few. The development of so-called reflex anuria and pain referred to the opposite kidney are connected with the so-called renorenal reflex. The kidneys receive their innervation from the major and minor splanchnics and from the vagus. It is said that there are sympathetic ganglia in the kidney itself which may be a reason why the kidney with all afferent nerves severed shows adaptability to various functional stimuli. The afferent nerves, however, have a certain influence which is not entirely clear at the present time. The sympathetic branches pass to the celiac ganglion, and this is probably the first station where reflex stimuli may be transferred from one side to the other very probably there is another station in the spinal cord although the further course of these tracts upward is unknown. It is also not known with certainty whether these nerves are directly secretory or whether they act through vasomotor changes or both. Certainly there are abundant vaso nerves present and the kidney receives an extraordinarily large amount of blood compared to its size. The kidney capsule, the pelvis, and the renal connective tissue contain nerve filaments and these probably are concerned in

the pain in certain kidney lesions. Reflex anuria has been produced experimentally by stimulation of a number of different areas, for example the sciatic nerve, vagus, bladder and ureter. To sum up there are certain general anatomic grounds known for the occurrence of pain and of reflex anuria, but the exact details are still lacking.

Not long ago we had a patient in the hospital with complete anuria for a number of days. At autopsy both ureters were found plugged tightly with uric acid calculi. There was slight dilatation of the pelvis of the ureters and the kidney tissue was entirely necrotic with the exception of the glomeruli, which showed degenerative changes, but were still preserved. This brings up the subject of obstruction to the outflow of urine. Briefly stated, sudden ligation of the ureters leads to quick necrosis of the kidney whereas a more gradual or incomplete closure leads to the development of hydronephrosis. The former is important especially in operations on the uterus in which the ureter may be accidentally tied. It is certain that complete obstruction for even a matter of a few hours leads to injury. Just how severe will depend on the length of time. Among other things in reference to the second process it may be mentioned that extensive dissection and loosening of the ureter from its bed, as may be done in removing calculi leads to such interference with the motility of the ureter that hydronephrosis and perhaps pyonephrosis frequently results.

Finally a few words may be said regarding the kidney itself. It is often necessary to incise the organ. Many experimental and clinical studies have shown that the kidney heals readily. Scar tissue forms a tight union, and although there is growth of epithelium it is rather irregular and probably non-functioning. It is not necessary to call attention to the fact that when one kidney is removed the other hypertrophies and this increase in size is probably only hypertrophy of the elements that are present and not an actual hyperplasia. The final thought is directed to calling attention once more to the differences between the two kinds of kidney insufficiency. The one is imitated fairly well by the symptoms shown in an

animal which has had both kidneys removed the other is the toxemia from the failing kidney because of nephritis or nephropathy to use the term in late use. The difference between the two have led to the assumption more than once that a kidney with Bright's disease produces symptoms not merely because of its lack of functioning ability but also because of the addition of some toxic factor. Differential diagnosis will lead at times to decidedly different methods of treatment.

## CYST OF THE LIVER—EXCISION

THE next case comes to operation with a diagnosis wavering between duodenal ulcer and cholecystic adhesions. The symptoms are rather obscure and x-ray findings indefinite. The patient is a male aged thirty five years. Six years ago he began to suffer from more or less constant epigastric pain, gradually increasing in severity for which he was treated medically for one year without relief. He then came to this hospital, where a diagnosis of chronic appendicitis led to the removal of the appendix, which showed evidence of marked chronic disease of that organ. After this the patient felt well for about three years, when the epigastric pain recurred with increasing severity. For the past two months it has been almost constant, aggravated by eating, regardless of the kind of food taken. There is occasional nausea but no vomiting. Bowels alternately regular and constipated. No urinary symptoms. Appetite poor. Constant headache. Loss of 5 to 8 pounds in the past five months. No venereal history.

Physical examination is negative except for the abdomen. There is slight rigidity and tenderness on deep pressure at the median line at a point corresponding to the site of the gall-bladder. The blood count is negative and so is urinalysis. A test meal was given, all of which the patient vomited. The stomach-tube was then passed. Quantity obtained 80 c.c. total acidity 12 full meal quantity 50 c.c. total acidity 12. Also negative for lactic acid. Stools positive for blood.

x-Ray taken elsewhere before the patient was admitted gives the safe diagnosis of "upper right abdominal lesion," the referring physician hesitating between a diagnosis of duodenal ulcer and cholecystic adhesions.

We are evidently dealing with an upper right abdominal infection or the results of such an infection. The fact of a previous



animal which has had both kidneys removed the other is the toxemia from the failing kidney because of nephritis or nephropathy to use the term in late use. The difference between the two have led to the assumption more than once that a kidney with Bright's disease produces symptoms not merely because of its lack of functioning ability but also because of the addition of some toxic factor. Differential diagnosis will lead oft-times to decidedly different methods of treatment.

## CLINIC OF DR. J CHALMERS DACOSTA

### JEFFERSON MEDICAL COLLEGE HOSPITAL

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#### TUMOR OF PITUITARY BODY ACCOMPANIED BY ABSCESS OF BRAIN

JANUARY 4 1922 I bring before you a patient about whom I must speak with carefully chosen words because I think it quite possible that a lawsuit may result from this case and I wish to do injustice to neither party to the case.

This is a man, thirty years of age an Italian by birth, a laborer by occupation, who has lived for some time in Bridgeton, N J He was brought here to the Jefferson Hospital over three months ago after a head injury He was complaining of weakness in the right arm and leg of numerous attacks of spasm in the right arm, and of some other phenomena.

The family history is without bearing on the case. He had the usual diseases of childhood does not remember having had any other illnesses.

On September 21 1921 while at work, a large piece of steel dropped from a height and struck him on the parietofrontal region a little to the left of the middle line The patient was rendered unconscious, was taken to a hospital, where it was found that he had a depressed fracture and his skull was trephined

A few weeks after leaving the hospital his sight, which previously had been good, began to fail, and he noticed progressive weakening in the muscles of the right arm and leg This weakening has been getting slowly but gradually worse until the present time. He now suffers from severe headaches has occasional attacks of vertigo is heavy and dull, one might say stupid mentally and has gained about 30 pounds in weight.

chronic appendicitis gives us a focus from which infection may have spread. The history and study of this case would lead me to make a diagnosis of cholecystitis.

Let us proceed with the operation. I make the usual upper right rectus incision, going through the sponurosis of the internal oblique muscle. Here is the gall-bladder near the median line but in a very deep location and surrounded by a few cholecystic adhesions. I examine the stomach and the duodenum and find no lesions there. The gall-bladder also is normal. But here is a mass which looks like a gall-bladder protruding from the under surface of the liver. It does not seem to be a hydatid cyst, for I believe I know a hydatid when I see it. It seems to be liver substance. I shall try to remove it intact. There it is it has no odor and is perfectly soft. On section it seems to be filled with sebaceous material.

*This I believe is the most interesting case we have had this afternoon. It well illustrates some of the pitfalls of diagnosis, and calls attention to the many possibilities to be encountered in the right upper abdominal quadrant.*

The operation was completed in the usual manner. The laboratory report on the specimen reads: A fibrous walled cyst, measuring 3 cm. in diameter, received opened, and with some liver tissue adherent to it. The cyst is smooth, shiny congested on its outer surface, and pale and smooth on the inner surface. Contains chalky material.

**Microscopy** The lining of cyst is partially necrotic, but gives evidence of having been a sort of mucosa. The wall consists of dense connective tissue. Origin unknown, but may have been a diverticulum of the gall-bladder. Liver tissue shows moderate cloudy swelling and fatty degeneration.

probably damaged by the original injury and at present there are areas of impaired nutrition. There are adhesions between the membranes. The frequent attacks of spasm in the right arm are characteristically Jacksonian epilepsy but the destruction of the clinoids and enlargement of the sella, as shown by the x-ray are peculiarly significant of pituitary tumor or cyst. The recent rapid increase in weight is strongly suggestive of a pituitary tumor causing impairment of function of that important gland. We, of course must study this case more thoroughly. We must take the carbohydrate tolerance. We must follow all possible retinal changes day by day we must make a lumbar puncture and note the tension of the fluid. We must make a Wassermann test both of the blood and the spinal fluid.

You may well ask me, If this is a pituitary tumor of very considerable size why is there no hemianopsia? I don't know and to prophesy is a dangerous occupation, but I am strongly disposed to prophesy that this man will develop hemianopsia before very long but before we make up our minds to what we shall do surgically if anything, we will watch this case a short time longer.

January 18 1922 Further studies of this case show a very great increase in carbohydrate tolerance. Unfortunately the exact figures have not been transferred to this clinical history but they are available in the laboratory.

The spinal tap does not indicate excessive pressure. The spinal fluid contains 2 cells per cubic centimeter. The Wassermann test of both blood and spinal fluid is negative. Here I may say that an eye examination made three days after the occasion on which I first presented this case showed bilateral temporal hemianopsia.

I had an opportunity to see this man in one of his convulsive attacks, which started with a series of rapid and wide spread tremors passing from the right hand and forearm up to the shoulder. The shoulder was then raised as though he were taking hold of the head of the bed. The episode was brief. I then learned the following interesting fact—that all of these attacks came on with very marked aura. These were olfactory

You observe when I ask him any question he answers slowly but, I believe on the whole, accurately

The superficial and deep reflexes are minus in the right upper extremity and the right lower extremity exhibits ankle-clonus and the Babinski sign. You can observe the site of the old fracture, and the depression readily admits my thumb.

We ordered that an x ray be taken immediately and Dr. Manges reported an old depressed fracture over the left side of the cortex back of the coronal suture. The fragments had been removed. The skiagraph shows that the bone edges are smooth and slightly thickened along the anterior margin, especially of the inner table. No fracture line discovered in any other part of the head. The clinoid processes are almost completely destroyed which must have been brought about by the growth of a tumor in the sella turcica. There is marked depression on the floor of the sella, and the tumor or cyst, together with the pituitary body make a mass approximately 1 inch in diameter

The eye examination shows that the failing vision is due to the development of central, star-shaped opacities in the lenses. There is no choked disk. There is no lesion of any sort in the nerve of either eye. No palsy of the eye muscles.

Doctor Gilpin reported that there was very slight palsy of the right side of the face. The tongue is slightly deviated. The right arm is almost completely paralyzed. There is some voluntary motion of the right leg. Doctor Gilpin is of the opinion that the trouble is with the motor cortex because of the loss of power of the right side, the loss of disturbance of motor speech, and the coming on of clonus and the Babinski sign in the right foot during the past two weeks.

Now it seems to me that we are here confronted with one of the common pitfalls in diagnosis. We find a man who has had previous traumatic cause for motor trouble and who now has something pointing to the motor cortex as the seat of trouble. We find furthermore, strong indications of another pathologic condition which may have antedated the injury. Now I am quite convinced there is cortical trouble. The corte was

probably damaged by the original injury and at present there are areas of impaired nutrition. There are adhesions between the membranes. The frequent attacks of spasm in the right arm are characteristically jacksonian epilepsy but the destruction of the clinoids and enlargement of the sella, as shown by the x-ray are peculiarly significant of pituitary tumor or cyst. The recent rapid increase in weight is strongly suggestive of a pituitary tumor causing impairment of function of that important gland. We of course must study this case more thoroughly. We must take the carbohydrate tolerance. We must follow all possible retinal changes day by day we must make a lumbar puncture and note the tension of the fluid. We must make a Wassermann test both of the blood and the spinal fluid.

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and gustatory a hideous odor and a horrible taste. These warnings or signals are known to accompany pituitary epilepsy and to indicate pressure upon or irritation of the uncinate lobe.

We know that pituitary tumor may be responsible for epilepsy and that old epileptics may present evidence of pituitary disease but as far as I know such a condition is a general epilepsy and not a focal one. We know that irritation of the motor cortex may produce focal epilepsy but there seems to be no reason why it should be ushered in by a sense of smell and taste. A possible hypothesis is that the cortex in the motor area, being in a state of impaired nutrition, is the first part to lose control when the epileptic influence comes sweeping through the brain from the uncinate lobe.

The nature of these spasms is the interesting and curious feature of this difficult case. We have in mind to lay down a bone-flap expose the motor area at the site of trouble, and endeavor to reach the pituitary body by retracting the brain.

February 1 1922 In a previous lecture I showed an individual who had cortical trouble from a head injury and also a pituitary tumor. I dwelt on the diagnostic difficulty caused by two conditions. To our surprise we have learned that our late patient had three conditions.

I must have had my guardian angel in a peculiar state of attentiveness when I was saved from operating on this patient, as in all human probability I would not have found the third condition which we now consider.

On the evening of January 26th the patient became heavily stuporous, soon comatose and died of respiratory failure. The specimens obtained at the postmortem I now lay before you.

The postmortem shows a large pituitary tumor cortical adhesions, and a large abscess of the brain. The abscess took origin in the brain substance above the left lateral ventricle. It was beneath the region of the cortex which underlay the depressed fracture but did not reach the surface at that point. You can see the abscess distinctly where the brain was sectioned. Had I exposed the cortex in the search for the seat of disease I believe I would have missed the abscess.

This patient died from rupture of the abscess into the ventricle. The abscess was the result of the injury. The pituitary tumor may have been the result of the injury though the complete absorption of the clinoids would suggest a longer duration. Rapidly growing sarcoma would, however be capable of effecting this rapid destruction. I am unable to decide what part the abscess played in the epilepsy. It is strange that until the last few hours of life we found no definite pressure signs.

I append the postmortem report of Dr. Edward Weiss

Laboratory No. 13,990.  
Clinical History No. K-4333.  
Museum No. 3843.

Spectra received 1/29/22.  
Preliminary diagnosis Pituitary tumor  
Report submitted 2/20/22.

Death January 26 1922 9.50 P. M.

Autopsy January 29 1922 10 A. M. Limited to head.

Body of Mr. X

Service of Prof. J. Chalmers DaCosta.

Body is that of an adult white male 12.5 cm. from the glabella and 16 cm. from point of occiput the skin is thin and fibrous, and upon reflection of the flap a circular opening is seen in the cranium corresponding to this area and measuring 2.5 by 3 cm. Removal of the skull cap shows that the membranes are densely adherent to the edges of this opening the membranes otherwise appear normal. When the brain is lifted a tumor is seen occupying the sella turcica, and pus exudes from a region corresponding to the floor of the third ventricle. The tumor measures 3.5 by 3 by 2.5 cm. weight 18 gm. It is shaped like an olive and is situated with the long axis from side to side. The tumor is fairly soft, has a thin capsule and fits closely into the sella turcica pressing upon the optic nerve. On section the tissue is soft, smooth and glistening yellowish pink and mottled. Numerous minute blood vessels are visible. The tumor is attached to the brain proper by an attenuated infundibulum. The pus issuing from the base of the brain is greenish yellow and viscid. Horizontal section of the brain substance shows a large quantity of this purulent material in the left lateral ventricle communicating below with the third. It infiltrates and appears to arise in the cerebral substance



above the left lateral ventricle, approaching but not quite reaching the surface of the brain in the area of the depressed fracture.

**Bacteriology** Inoculations prepared from the brain abscess yielded the staphylococcus.

**Histology** The tumor is composed of a mass of small round cells numerous thin walled blood vessels, and loose fibrous tissue supportive structure. The cells are small usually round the nuclei are large and deeply stained the protoplasm is small in amount and takes the acid stain. The supportive connective tissue is scanty and loosely arranged, but condensed at the periphery to form a capsule which is infiltrated with tumor cells. The blood-vessels are numerous, thin walled in intimate contact with the tumor cells, and distended with blood. Some of the cells infiltrating the capsule are larger than the predominant tumor cells, and contain one or even two deeply stained round nuclei and a large amount of pink protoplasm (*hematoxylin-eosin*)

**Diagnosis** Round-cell sarcoma of the pituitary gland.

Respectfully submitted,

EDWARD W'KINS.

## CLINIC OF DR ASTLEY P C ASHHURST

### EPISCOPAL HOSPITAL

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#### CASE I. STRICTURE OF THE RECTUM. RESECTION

THIS patient is a man forty-seven years of age he came into the hospital on October 15 1921 his chief complaint being pain in the rectum and constipation. He has a long surgical history. He acquired gonorrhoea when twenty two years of age and developed strictures shortly afterward, and when twenty-seven years of age he was operated on by Dr Neilson at the University Hospital by external perineal urethrotomy. He has had no trouble with his strictures since. Ten years ago he was in the Philadelphia General Hospital, where Dr T Turner Thomas repaired a right inguinal hernia and at the same time opened an ischio-rectal abscess and in doing the latter found a stricture of the rectum which he dilated.

After this he remained well for eight years but over one year ago the hernia recurred and has gradually grown larger but it is not painful and is always easily reducible. He had lobar pneumonia in February 1921. He says he never knew that he had a stricture of the rectum until after the operation for ischio-rectal abscess, when he was told that one was found during the operation. Up until about eight months ago he had no particular trouble but since that time it has become more and more difficult to get his bowels open, and I suppose it is certainly the straining incident to the efforts to evacuate his bowels that has brought about a recurrence of his hernia. In a large majority of patients with chronic intestinal obstruction you will find one or more herniae are present.

Examination was negative on admission except for the scar of the hernia operation the scar of the external perineal ure-

throtomy and a stricture about 4 or 5 cm. within the anus which just admits the index finger. His blood Wassermann is negative. Naturally one wants to find a cause for a stricture such as this, and there seems to be nothing in this patient's history to account for it except the external penileal urethrotomy. It is a well-known fact that a certain number of women who have vaginal or other lesions produced during childbirth may develop strictures of the rectum from the inflammation propagated from the genital tract to the walls of the bowel. I have seen 2 such cases myself. The *first patient* a woman fifty-three years of age, had acute intestinal obstruction supervening upon a chronic obstruction, and all that could be done was a colostomy which relieved her discomfort for a few days before death. Autopsy showed a benign stricture of the rectosigmoid and according to the history the onset of rectal trouble followed an injury in childbirth thirteen years previously. A *second patient* a negro woman thirty five years old, was under my care in August, 1919. Four years previously following childbirth, she developed a fistula from the bowel into the lower end of the vagina, and before she came under my care she had had five different operations trying to close this fistula. Her chief complaint was that the bowels moved from the vagina as well as from the anus. Only at the fifth operation apparently did the surgeon find that there was a stricture within the anus and recognize this as the cause of the persistence of the fistula, it being easier for the bowels to evacuate themselves through the fistula than through the stricture. As I expected to postpone any formal operation on the fistula until after relieving the stricture, I attacked the stricture first, and by thoroughly dilating the sphincters exposed to view a stricture in the rectum which would not admit a finger and barely admitted a urethral sound. I merely divided the stricture by an incision from its mucous surface all the way through the posterior rectal wall and well past the margins of the induration, and thoroughly dilated the rectum, and passed the largest sized cigarette drain procurable through the stricture. The patient removed this herself on the second day after the operation and, curiously enough, with the moderate use of laxatives, which kept her

bowels moved several times daily all the feces passed through the rectum and none came into the vagina. Upon her discharge from the hospital three weeks after operation examination showed only a very minute communication between the rectum and vagina the stricture was considerably less tight than before and she was allowed to go home to return later if there was any

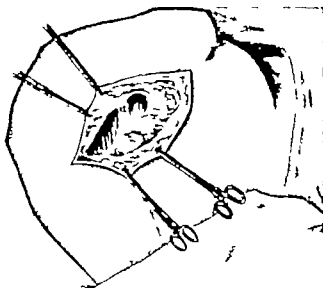


Fig. 6.—Resection of the rectum. The patient in the Sims position and the head of the table lowered. The skin incision runs from point just back of the anus up along the right side of the sacrum almost to the posterior inferior spine of the ilium, exposing the coccyx and the origin of the right gluteus maximus muscle.

more trouble. Two years later she reported that she was "all right" in every way and required no further operations. But I do not think that simple linear proctotomy as it is called is a very desirable way of treating strictures of the rectum and what I propose to do in the patient now before us is a circular resection of the rectum by the coccygeal route, with end-to-end anastomosis of the bowel above and below. I have examined this

patient with the proctoscope since his admission to the hospital, and as the proctoscope can be passed through the stricture I was able to ascertain that the bowel above appeared normal. There is no reason to think that the stricture is carcinomatous. He says that he has felt better since the stricture was stretched by the passage of the proctoscope. You see that I have him lying in the left lateral prone position, like the Sims position for gynecologic work, and by making an incision from just posterior to

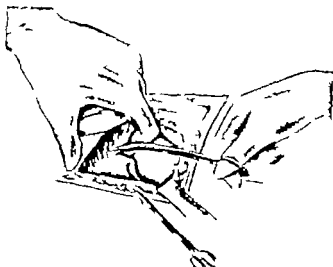


Fig. —Removal of the rectum. After excision of the coccyx the gluteus maximus is cut from the sacrum, rolled up into the sacrospinous notch.

the anus up along the right margin of the coccyx and the sacrum almost to the right posterior inferior spine of the ilium (Fig. 6) and detaching the right gluteus maximus from the sacrum after excising the coccyx (Fig. 7) I can expose the rectum high enough in the hollow of the sacrum for such a case as this without removal of any of the sacrum itself which, after all, gives very little better exposure. Passing a finger round the rectum as high up as possible and opening the peritoneal cavity I insert a pack to hold the small intestine away and I also have the head

of the operating table lowered (Fig. 8) This will decrease the venous bleeding as well as keep the intestines out of the operative field. The superior hemorrhoidal artery running here on the posterior wall of the rectum is tied and cut and two tapes are passed around the rectum mobilizing it and drawing it up into the wound (Fig. 9) Then I divide the rectum transversely above the stricture and turn the lower end down, and here I find it is very densely adherent in the region of the old scar in the



Fig. 8.—Resection of the rectum. The peritoneal cavity has been opened on the right side of the rectum, and gauze pack is inserted to hold the small intestines out of the pelvis.

perineum. I find no indication of the rectoprostatic space which normally exists but which I suppose has been obliterated by the previous inflammatory changes. This rectoprostatic space called by the French "*l'espace décollable rétroprostatique*," is, as you know comparable to the tunica vaginalis of the testis. In fetal life it was a prolongation of the peritoneal cavity but has become obliterated at its upper end. Thus if in the anatomic room you attempt to separate the parietal peritoneum from the underlying structures in the pelvis by means of blunt dissection

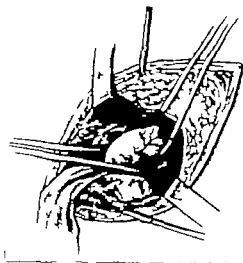


Fig. 9—Resection of the rectum. The lower sigmoid is drawn into the wound and supported by tapes. The superior hemorrhoidal artery has been ligated and divided preparatory to section of the bowel.

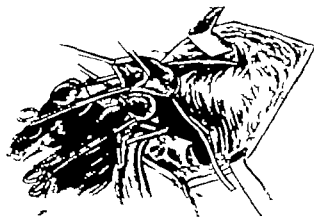


Fig. 10—Resection of the rectum. After transverse division of the bowel above the stricture the lower segment is turned downward, and the levator ani muscle is cut away on each side to a point below the stricture.

it is easy enough to do so until you reach the rectovesical pouch here you will find it necessary to use scissors for the dissection.

Having now mobilized the lower segment of the rectum sufficiently I will cut the levator and on each side from the rectum (Fig 10) and splitting the sphincters posteriorly divide the rectum transversely below the stricture and remove the segment containing the stricture. The segment removed is from 6 to 7 cm. in length and I find now that the proximal end of the rectum reaches to the distal without much tension,

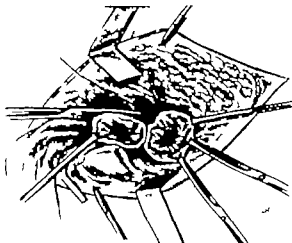


Fig 11 - Resection of the rectum. End-to-end anastomosis by means of through and-through mattress sutures of chromic gut, with the knots on the outside of the bowel.

and I will unite one to the other by a number of interrupted chromic mattress sutures, introducing them in such a way that the loops of the sutures will be on the mucous surface of both segments of the bowel and the knots on the outside (Fig 11). This will invert the mucosa (Fig 12) and, I hope, secure dry healing although it is unusual for patients on whom this operation is done to recover without some fecal discharge through the wound before the latter finally heals. The operation you see is a tedious one. It has taken over an hour and a half but



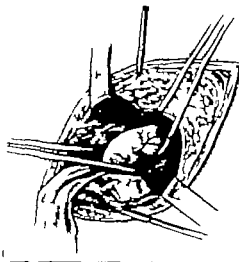


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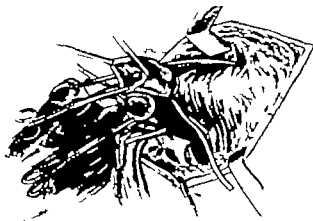


Fig. 10.—Resection of the rectum. After transverse division of the bowel above the stricture the lower segment is turned downward, and the levator ani muscle is cut way on each side to point below the stricture.



Fig. 13.—Stricture of the rectum, removed by resection (Case I). The specimen has been split longitudinally showing the prominent shell which formed the upper border of the stricture and below the sectioned fibrous wall composing the stricture.



Fig. 14.—Case I. Photograph made two months after resection of rectum, showing healed cicatrix.

the patient is in very good shape. I will leave a gauze wick passing through the sutured area of the bowel and protruding at the anus, as well as a rubber tissue drain to the hollow of the sacrum, and will close the soft structures in layers.

(The pathologic report on the specimen by Dr C. V. White showed it was a benign fibrous stricture with no evidence of carcinoma. After hardening in formalin the specimen was split longitudinally (Fig. 13) showing above the normal rectal wall raised by an abrupt shelf at the upper border of the

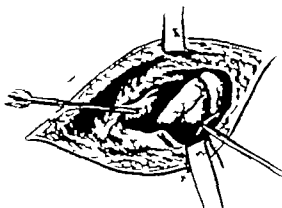


Fig. 12.—Resection of the rectum. End-to-end anastomosis completed. The mattress sutures have secured good inversion of the mucous surfaces.

stricture. The lower margin of the stricture is shown sectioned transversely.)

*Note.*—There was much serosanguineous discharge from the drainage tract for the first two days after operation. The bowels moved by a laxative on the fourth day and by the first of November a week after operation the wound was practically clean. On November 5th, however there was quite a profuse discharge of fecal matter through the incompletely healed drainage tract. To control fecal discharge it is best to stop all fluids by the mouth, to administer deodorized thure

## CASE II. CARCINOMATOUS STRICTURE OF RECTUM ABOVE THE ANUS. RESECTION AND END-TO-END UNION

WILLIAM J. forty-eight years of age, is now in the ward in the next bed to the man with stricture of the rectum upon whom I have just operated. He also has a stricture of the rectum just above the sphincters and a small *fistula in ano*. His chief complaint is pain in the rectum and inguinal hernia. For about a year he has noticed that he would have continuous sharp pain in the rectum after being on his feet for a while. He would then have to sit down, although this did not relieve him very much. He thought he had piles. Three months after this—that is to say nine months ago—he noticed that his stools were becoming small in size and ribbon like. The stools are very small at present and he has continuous pain in the rectum, which is worse when at stool. His pain is sharp and burning and has not been relieved by any of the medicines which have been prescribed for him previous to his admission to the hospital. He has never passed blood by the bowel his appetite and digestion are good and he thinks he has lost no weight.

Examination on admission was negative except for bilateral inguinal hernia (the hernia on the left being a little larger than that on the right) and the rectal condition. Examination of the rectum shows a *fistula in ano* opening into the right posterior quadrant a few small hemorrhoids and about 5 cm. above the internal sphincter a stricture admitting the index finger with difficulty. This stricture is hard, apparently encircles the lumen of the bowel, and is about 1.5 cm. in breadth except its anterior third, which is less pronounced. The rectum is not adherent to the surrounding structures the prostate is soft the inguinal lymph-nodes are slightly enlarged, especially on the left. On admission this man's urine was negative but his phthalein output was only 5 per cent. for the first hour and

of opium in fairly large doses, and to give the patient a daily enema. This plan was adopted in the present case, and less than two weeks later the sinus had entirely ceased draining and he was allowed to have 750 c.c. of water daily by mouth. A month after operation he was out of bed and before being discharged from the hospital my associate, Dr Crossan repaired his inguinal hernia. At the time of his discharge early in January 1922, he had good control of his bowel movements unless they were too loose. The sphincter of the anus was strictured, barely admitting the index finger but the rectum felt absolutely normal from within no evidence of the anastomosis being palpable. Figure 14 is from a photograph taken at this time to show the scar of operation.

In February 1922, four months after operation, he reports himself as free from symptoms. His sphincter easily admits the index finger and he has never soiled himself since leaving the hospital but once recently when he had a severe diarrhea from some indiscretion in diet.

still wears a gauze pad and T-bandage and he keeps to a rather dry diet. Digital examination shows the sphincters relaxed



Fig. 15.—Carcinoma of rectum, Case II. Cross-section of the specimen removed by resection.

but not paralyzed and within the rectum no abnormality can be felt except a fine linear cicatrix around the posterior circumference of the bowel at the site of the anastomosis.

10 per cent. for the second hour a total of 15 per cent. which is very low. His red blood-cells numbered 4,450,000 and his hemoglobin was 67 per cent. Under treatment his phthalein output rose rapidly and six days after admission the report showed 35 per cent. excreted in the first hour, 30 per cent. in the second hour or a total of 65 per cent. His blood Wassermann is negative. Though I suspect that the stricture may be carcinomatous, there is nothing except its extreme hardness and the absence of any obvious cause for a benign stricture to make me think it is malignant. It does not appear to be ulcerated and as it is situated so low in the rectum, yet not involving the sphincters, it seems to be a suitable case for resection of the rectum by the coccygeal route with end-to-end anastomosis, as in the patient you have just seen and I propose to do this same operation on this second patient within a few days.

*Note.*—Operation was done on this patient October 29, 1921 and was precisely similar to that just described, except that it was not necessary to divide the sphincters to amputate the rectum above them, the stricture being a little higher in this patient than in the one on whom the operation was done October 25th. A gauze wick was left in the anus up past the anastomosis, as in the previous case. This man developed a fecal discharge through his wound on the eighth day after operation, but on dry diet, with no fluids by mouth, deodorized tincture of opium three or four times daily and a daily enema before the dressing of his wound this almost ceased to discharge in the course of three weeks. Then only gas passed through the sinus and finally the wound healed entirely. When he left the hospital, December 24th, just eight weeks after operation, he had been able for some time to control his bowel movements if they were not too loose.

The laboratory report, unfortunately, showed a scirrhous carcinoma. Figure 15 shows a cross-section of the rectum through the stricture.

In February, 1922, he reports in the same condition. His bowels move usually twice daily and unless they are loose he has sufficient control over them but for fear of accidents he

still wears a gauze pad and T-bandage and he keeps to a rather dry diet. Digital examination shows the sphincters relaxed



Fig. 15.—Carcinoma of rectum, Case II. Cross-section of the specimen removed by resection.

but not paralyzed and within the rectum no abnormality can be felt except a fine linear cicatrix around the posterior circumference of the bowel at the site of the anastomosis.





### CASE III. CICATRICIAL CONTRACTURE OF BUTTOCKS NEARLY OCCLUDING ANUS. PLASTIC OPERATION ON THE BUTTOCKS

THESE patients with strictures so near the anus recall to my mind a lad eighteen years of age on whom I operated two years ago for a stricture below the anus resulting from burns at the age of two months. At this tender age he had convulsions and was put in a tub of hot water severely burning both his buttocks. The burned area gradually healed with marked contraction, and eighteen years later he came to the hospital complaining of constipation and abdominal pain. His constipation had gradually been growing more obstinate, and he had to be very careful what he ate, as any heavy food caused very obstinate constipation. For some years his bowels had opened only once a week and then only as the result of drastic purgatives and the stricture was so tight that he had to have assistance in removing the fecal matter from his anus.

Examination was negative, except for the region of the buttocks which was occupied by a dense, broad indurated cicatrix, with a very small, firm aperture over the anus which would not admit the index finger and barely admitted the tip of the little finger. It was impossible while in the hospital before operation to get his bowels thoroughly opened, so four days after admission I operated on him doing a plastic on the cicatrix of the buttocks. This operation is best understood by the accompanying diagram (Fig. 16). I made two semilunar incisions with their convexity toward the stricture, leaving uncut skin at each side between the anterior and posterior incisions (Fig. 16 a). The triangular flaps thus outlined were dissected back and front, exposing the strictured canal (Fig. 16 b). This stricture was then incised in midline anteriorly and posteriorly up to the external sphincter (Fig. 16 c). Fortunately all the scar tissue was external to the sphincter the canal of the stricture involving the skin only and being about 2 cm. in length. The anterior and posterior triangular flaps were then sutured into the gaps made by incising the strictured

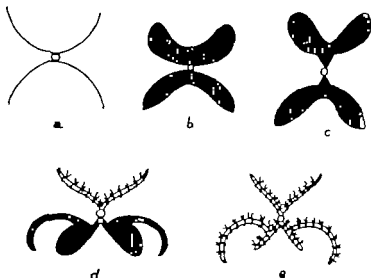


Fig 16—Case III Plastic operation for clostrix of buttocks, occluding os. (See text.)



Fig 17—Case III one week after plastic operation on buttocks for constrictions resulting from burns at the age of 18 months

canal. The anterior flap completely filled the gap but the posterior left secondary gaps over each buttock (Fig 16 d) and to close these I cut a flap from each buttock and swung it toward the anus thus securing complete closure without tension, while the patient was in the lithotomy position (Fig 16 e). I should add that as soon as the anus was exposed at the operation the wound surfaces were swabbed with 2 per cent. picric acid and the rectum was thoroughly irrigated until the fluid returned clear and that at the end of the operation

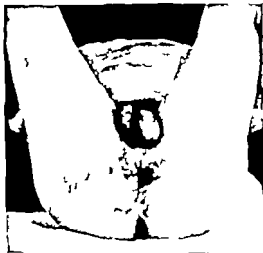


Fig 18—Case III more than two years after plastic operation on buttock for cicatrices causing stricture of anus

a drain was left in the spaces between the posterior flap and the coccyx as a matter of precaution. Figure 17 is from a photograph made just one week after operation. Four weeks after operation the wound was all healed but one or two granulating spots, the boy's bowels were opening every day without any laxative and I have recently seen him (during the month of January 1922) over two years since the operation, and there has been no further trouble of any kind. Figure 18 is from a photograph made at this time.



#### CASE IV ABDOMINAL EXTIRPATION OF THE RECTO-SIGMOID FOR BENIGN STRICTURE DUE TO LOCALIZED MUSCULAR HYPERTROPHY

I WANT to tell you also about a patient who has lately been discharged from the hospital and who had an obstruction of the sigmoidorectal juncture from a lesion which I have not seen described as causing symptoms. He was a man sixty three years of age, a carpenter by occupation, sent in to the hospital by Dr Bigley on September 8 1921. He had always been healthy but for eight years had suffered with indigestion and diarrhea alternating with constipation. His chief complaint was pain in the upper abdomen. This had lasted for more than six weeks it was dull and throbbing and there was always present a sensation of heaviness. The pain was not influenced by meals. He belched a good deal, but had never had nausea nor vomited. He had never been jaundiced, never passed any blood in his stools but said that lately his bowel movements had been ribbon shaped. He claimed to have lost 10 pounds in the last six weeks. His daughter said that he had often started out to his work in the mornings all doubled up with pain in the abdomen.

His weight on admission was 130 pounds (59 kg.) he was well developed and well nourished, apparently not very ill and though somewhat thin, his color was good. Examination was otherwise negative, his abdomen being soft, with no areas of tenderness or rigidity. There was a medium-sized right oblique inguinal hernia and a small left inguinal hernia, both easily reducible.

Rectal examination showed the prostate slightly enlarged, but otherwise negative. If it had not been for the x ray examinations of his gastro-intestinal tract, made by Dr Bromer it would not have been easy to make a diagnosis of any definite lesion from the symptoms and the gross physical examination. This x ray examination showed that the esophagus was normal

that there was slight ptosis of the stomach, but normal peristalsis and mobility— that there was no six-hour retention and no filling defects in the stomach. Examination twenty-four hours later showed a marked spastic condition of the large bowel the cecum and ascending colon being very short. The forty-eight-hour examination showed marked hypermotility the bowel being completely empty— there was nothing in the stomach to account for the patient's symptoms.

Dr Bromer suggested another examination after the administration of a barium edema in order to exclude a lesion of the large bowel. This examination was made a few days before the patient's admission and showed a circular serrated filling defect where the sigmoid flexure joins the rectum. Dr Bromer's conclusion was that this was the cause of the man's symptoms and could be caused by an annular constriction from a carcinoma though it might also be due to adhesions.

The man's blood Wassermann was negative as was his urine. In view of the history and the x-ray findings I thought that there was an obstruction, probably an early carcinoma, at the point indicated by the x-ray study. It is well to be guarded in one's conclusions when they are based on x-ray study alone. I had some months since in my care in the hospital here a patient, fifty-nine years of age, who brought with him an x-ray plate made by an outside roentgenologist and which showed very prettily a filling defect in the sigmoid (Fig 19). As this patient's symptoms pointed to a lesion of the large bowel and the x-ray findings were so very definite I operated upon him expecting to find an obstructive lesion as indicated by the x-ray but I must say that our own roentgenologist, Dr Bromer when he looked at the plate which the patient brought with him to the hospital, told me that he did not feel sure that the constriction was other than a spasm and on opening the patient's abdomen I found no lesion at all in the sigmoid or rectum and the removal of chronically adherent and inflamed appendix has entirely relieved his symptoms of constipation and indigestion and he is now some six months after operation able to enjoy and digest any food has gained 40 pounds (18 kg.) in weight and is in every way in

excellent health. But in the case of the patient I am now discussing the constriction shown by the x ray was too constant to be the result merely of spasm and I decided to explore his abdomen with a view to doing a radical extirpation of his recto-sigmoid.

In preparing patients for operations on the large bowel I believe it is very desirable not only to have the intestinal tract well purged but, after the purging has been secured, to administer to them enough opium to dry up the intestinal secretions as much



Fig. 19—Spastic sigmoid simulating annular carcinoma. Operation showed no lesion in the sigmoid. Removal of an adherent vermiform appendix relieved all the patient's symptoms.

as possible. Of course many operations must be done in emergencies on the large bowel for acute obstruction, or in chronic obstruction which has become acute but whenever possible it is my practice to have the patient purged one or two days in advance, and beginning the night before the proposed operation to make him take 15 minims (1 c.c.) of the deodorized tincture of opium every three hours, and I am sure that this has simplified the operation and promoted healing without infection.

On opening the abdomen September 13 1921 with the pre-



operative diagnosis of carcinoma of the rectum I proceeded first to examine for metastases, but found the liver, stomach, pylorus, gall-bladder and pancreas apparently normal. The rectum and the lower sigmoid were abnormally thick walled for a distance of about 10 cm., with definite terminations of this thickening above and below and though it was not like anything I had seen before, I concluded that as it might be an early carcinoma it would be safer to treat it as if it were, rather than close the abdomen doing nothing. The thickening was so low down that it was entirely out of the question to resect and do an ordinary end-to-end anastomosis. It was necessary to do a combined operation from within the abdomen and from below. So I proceeded to mobilize the sigmoid by dividing the outer layer of the mesosigmoid and turning the bowel toward the midline and then divided the sigmoid with the cautery about 10 cm. above the stricture invaginating both ends. The upper end was isolated by one of the packs, and the lower end, including the rectum was stripped from the hollow of the sacrum down to the perineum after ligation of the superior hemorrhoidal vessels at their origin. This segment of bowel was doubly clamped above the perineum and divided between the clamps with the cautery the diseased segment, 25 cm. in length, being removed. The proximal end of the sigmoid, it was found, would reach the lower end of the rectum without tension so this proximal end was opened and a rubber tube with a lumen of 12.5 mm. was sutured into it, and the end of the sigmoid was inverted around this tube by purse-string of chromic catgut. Then I asked Dr Boykin who was assisting me, to dilate the anus and to divide the sphincter posteriorly and through the lower end of the rectum to pass a long forceps up into the abdominal wound. I then placed the end of the tube (already sutured into the proximal sigmoid) in the bite of Dr Boykin's forceps (Fig. 20) and as he withdrew his forceps through the anus the proximal sigmoid was drawn down into the lower segment of the rectum. I had taken the precaution to place a number of mattress sutures of chromic gut in the end of the sigmoid before Dr Boykin drew it down into the pelvis, so that to complete the anastomosis between upper

and lower segments it was only necessary to insert the ends of the sutures (which had been left long for the purpose) into the lower segment just above the perineum and thus secure firm closure around the tube. These sutures were inserted through the abdominal wound. I placed a rubber tissue drain in the extraperitoneal space around the rectum, closed the peritoneum over it, and then closed the abdominal wound in layers, without drainage. Finally an incision was made in the left ischio-rectal fossa and the end of the rubber tissue drainage previously placed from above was withdrawn through the ischio-rectal incision.

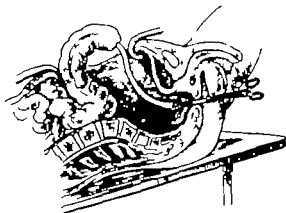


Fig. 20—Abdomino-anal extirpation of the rectum, Case IV. After removal of the diseased segment of bowel rubber tube is fixed into the proximal sigmoid, and is drawn into the distal rectum by forceps passed through the anus.

It is certainly true that in cases of carcinoma situated at the lower sigmoid or upper rectum this combined operation completed in one stage is preferable whenever it can be done and with the use of a rubber tube, as I have described it, a method which I believe was first introduced by Mr. Mummery, surgeon to St. Mark's Hospital, London, about the year 1908. It is not difficult to complete the operation within a reasonable time and to secure firm union. It took me a little over two hours to do this operation, but the patient recovered without any unfavorable symptoms, although the tube (which I had expected to remain in the human



Fig. 21—Specimen of rectosigmoid (Case IV) showing stricture from hypertrophy of mucular wall. Note abrupt beginning and ending of the thickened wall.

of the intestine to protect the anastomosis until the latter was firm) was found pulled out of his anus the morning after opera-

tion. I presume he did this during his sleep. There was a profuse sanguineous discharge from the drainage tract in the ischio-rectal fossa for a few days, but the patient's temperature never rose above 100.4 F. and though feces were discharged on the fourth and fifth days after operation from the drainage tract this gradually healed up and on October 5th, three weeks after operation he was out of bed and went home a week later entirely healed, except for a superficial area in the abdominal wound which had been burnt by the cautery used in dividing the rectum. He returned to the hospital and was shown at a staff meeting some time later being in excellent health and with no abdominal symptoms of any kind entirely relieved from his previous troubles. (In February 1922 five months after operation, he continues to be free from symptoms, his weight is 150 pounds (68 kg.) a gain of 25 pounds (11 kg.) since leaving the hospital.)

Now the interesting part of the patient's history to my mind, is not so much the operation as the pathologic findings. Dr. C. L. White our pathologist, can find nothing wrong with the rectum except a hypertrophy of its muscular walls over the area which was grossly thickened (Fig. 21). There is no ulceration, and while the lumen of the bowel is very much diminished there is no inflammatory change to be found and no apparent cause for the condition yet Dr. White tells me that in perhaps 1 or 2 per cent. of autopsies such a condition of localized muscular hypertrophy of the wall of the sigmoid may be found, but he does not know that it was ever productive of symptoms.



## CASE V CARCINOMA OF THE SIGMOID CAUSING CHRONIC OBSTRUCTION; RESECTION; DEATH

I HAD a man, fifty two years of age, under my care a year ago admitted to the medical ward of the hospital (Dr Robertson's service) August 7 1920 and transferred to my care the day of operation, August 13 1920 whose chief complaint was stomach trouble, pains in the abdomen, and constipation. He had been in good health up to five years previously when he had had an attack of abdominal pain but he took a heavy purge and his symptoms cleared up in a few days. Since then he had been perfectly well up to five days before admission. His stomach had always been very good, he never had any indigestion, he could eat anything. His bowels were pretty regular but he took a laxative occasionally yet for five days before admission he had had no bowel movement, although he had taken three doses of salts and two of castor oil. These medicines made him vomit and he had eaten nothing for five days, but had not kept to his bed, except a day or so before admission. He was sent to the medical ward from the receiving ward with the diagnosis of acute gastritis and chronic constipation, and one would scarcely expect a man with such an excellent previous record and with only five days illness to have any lesion that must have lasted for many months, if not years. Dr Bloodgood has stated on many occasions that it is a disgrace to have carcinoma because it is a perfectly preventable disease but in the present instance, and also frequently in cases of carcinoma of the stomach, at least in my own experience the growths have not given any indication of their presence until they have been well advanced or entirely inoperable. This patient is an instance of the kind. Examination on the medical ward was practically negative the abdomen was soft and was moderately tympanitic on percussion there was a small mass on the right side near the umbilicus which was tender on pressure there was slight abdominal pain rectal examination showed the rectum dilated and a

moderately enlarged prostate. The knee-jerks were decreased, but otherwise the extremities were negative. His blood examination and urine examination were negative and his blood Wassermann was negative. An x-ray examination made by Dr Bromer showed that "the esophagus was normal, that free fluid was demonstrable by a wave in the abdominal cavity that the stomach was lying high with apparently a constant filling defect near the pylorus but no retention. It seemed to be pressed upward by the free fluid. The large intestine was greatly distended and enlarged both by air and the barium meal, especially the ascending, transverse, and descending colon. Examination was unsatisfactory because of the presence of the fluid, but Dr Bromer thought that the shape of the stomach suggested a carcinoma and that distention and enlargement of the cecum and colon might be due to some lesion beyond the splenic flexure causing obstruction. The notes on the medical ward the next day showed that they could detect a shifting dullness in both flanks, and that when standing the fluid seemed to fill the lower third of the abdomen when the patient was examined fluoroscopically. The liver was not palpable to the costal margin. On August 12th I was asked to see the patient in consultation. I diagnosed chronic intestinal obstruction and advised his transfer to the surgical ward for operation. His stomach was washed and 200 c.c. of 5 per cent. sodium bicarbonate solution was introduced, which he vomited shortly afterward. The next day under nitrous oxide and oxygen anesthesia I opened the abdomen through a right paramedian hypogastric incision, believing that the obstruction was in the region of the cecum because it was thought an indistinct mass could be felt here. I found that there was no free fluid that the cecum was negative that the small intestines were moderately distended, but that there was an annular constricting tumor in the sigmoid. The sigmoid was delivered with some difficulty into the incision already made, and I think this was a mistake. It would have been better having found that the lesion was in the sigmoid for me to have closed the first incision and made another in the left iliac region and to have exposed the sigmoid by the more direct

approach or even to have made a false anus in the cecum and postponed resection of the tumor until the intestinal obstruction has been relieved. However by dividing the adhesions of the outer layer of the mesosigmoid the tumor came into the wound sufficiently far for resection, and here again I think I erred perhaps in doing a one-stage resection in the presence of obstruction even though the latter was incomplete. After ligating the mesosigmoid



Fig. 22—Specimen of annular carcinoma of sigmoid resected from Case V

and clamping the bowel about 10 cm. apart above and below the tumor the latter was removed (Fig. 22) and an end-to-end anastomosis was done the mesosigmoid being repaired to prevent an internal hernia and the bowel was replaced and the wound closed without drainage. The patient did not vomit after the anesthetic and seemed at first to be about to do well. He was restless and noisy during the first night but the morning after the operation he was doing well and passing flatus and he



voided 24 ounces of urine on the day after operation. The second day he vomited a little bile, his hands were cold and clammy he was restless, but clear in his head and though peristalsis was audible, he looked as if he would die within twenty-four to thirty-six hours. Toward night he became very restless, but was relieved by lavage of the stomach, which removed a large amount of bilious material but the next day he died with a temperature of 98° F his pulse at 96 and his respirations 28. He did not die from peritonitis I think he died partly from the shock of the operation which involved considerable manipulation of the distended small intestines and packing them off to expose the sigmoid, and partly from toxemia from his chronic obstruction and partly from inefficiency of his kidneys, because on the second day after operation the amount of urine was much diminished and some red blood-cells and granular and hyaline casts were present. Dr White's pathologic report showed the mass was an adenocarcinoma of the sigmoid.

## CASE VI. PELVIC ABSCESS FROM CARCINOMA OF HEPATIC FLEXURE OF COLON

Now I said a few moments ago that patients may have internal carcinoma without giving any history which would have warned them of its presence. I recall, for instance the case of Mary C. seventy-six years of age, who was admitted to my care May 25 1915. She had always been healthy had no indigestion, and came in with the chief complaint of 'pain in the abdomen of four days' duration. She had vomited bile at the onset of the attack, her bowels had moved freely after a purge but had not moved since. She had retained nothing on her stomach for four days. Her abdomen was markedly distended and tender on pressure. Peristalsis was present over the upper and left areas of the abdomen no tumor was palpable and rectal examination was negative. When I saw her an hour after admission her temperature was normal her pulse 80 full and strong, and her white blood-cells numbered 15,000 of which 82 per cent. were polys. She did not seem extremely ill she was collected and talked clearly she had vomited that day but not since admission to the hospital. Her tongue was moist and fairly clean her abdomen, which was very fat, was very much distended, but not very tense except in the right iliac fossa, where also was the greatest tenderness. No mass could be felt and there was no dullness to percussion. Enemata given since admission had been returned clear no flatus had been passed.

The preoperative diagnosis was appendicular abscess. Under local anesthesia the abdominal wall was opened and a few whiffs of ether were given now and then, while the intestines were packed off and the retractors used. On opening the peritoneal cavity there was a flow of clear serum culture of which proved negative. Packs were then introduced, the adhesions toward the pelvis were broken up and a gush of colon bacillus

pus came from the pelvis. An adherent appendix, one point of which appeared to approach perforation, was removed, a glass tube and an iodoform gauze wick were placed in the pelvis, the isolating packs removed, and the inner part of the transverse incision was closed. This old lady did well at first. The glass tube was removed on the third day after operation, being replaced by a rubber tube. Four days after operation there was some fecal discharge in the wound and following this the distention became less, and within three weeks after operation she was able to be out of bed for a time though the fecal fistula persisted with moderate discharge. By July 1st, six weeks after operation she had gradually improved and had been up in the chair most of the time but from July 1st on she weakened rapidly and died on July 6th. The autopsy showed, in addition to numerous pockets of pus among the coils of small intestines and the layers of the mesentery and the fistula from the operative wound into the cecum also an adenocarcinoma at the hepatic flexure of the colon annular in shape 3 to 5 cm. in length, the mucous surface being ulcerated and with cauliflower-like projections, causing intestinal obstruction. The pelvic organs and gall-bladder and liver were normal, and the laboratory report on the appendix which had been removed at operation showed chronic fibroid appendicitis with purulent peritonitis and infiltration of the muscular coats with inflammatory exudate and though clinically I had thought that the acute illness was due to an attack of appendicitis, it may have been a perforation of the cecum microscopic in size with resultant abscess formation in the pelvis due to the chronic obstruction caused by the tumor at the hepatic flexure. I do not see that this old woman of seventy-six, who had been in perfectly good health until four days before admission presented any premonitory symptoms neglect of attention to which should have made her consider it disgrace to develop carcinoma. It was certainly not her fault that she was not operated upon sooner.

## CASE VII. CARCINOMA OF ASCENDING COLON: RESECTION, ILEOCOLECTOMY DEATH

In August, 1915 I had another patient with carcinoma of the ascending colon under my care. She was then fifty-four years of age and seven years previously she had been operated upon in the University Hospital for left tubo-ovarian abscess and fifteen months later she had had an incisional hernia repaired at St. Mary's Hospital. On May 1 1915 three months before admission, she had developed a severe pain in the lower right iliac fossa, which she thought was due to constipation. She took olive oil and was relieved. On May 15th she developed a dull pain in the epigastric region. This had no relation to the taking of food and lasted only two days, but had recurred since about once weekly and during the last two weeks she had had about four attacks of epigastric pain. Her physician thought she had gall-stones. She had alternating constipation and diarrhea. In some of these attacks she had been jaundiced she had lost 20 pounds (9 kg.) in weight during the last few months and on admission her weight was only 101½ pounds (45.5 kg.) Her appetite was poor and she looked weak and emaciated. Examination was negative, except for the abdomen. There was a mass felt in the right iliac fossa which was tender on deep pressure and probably was a distended cecum. The scar of the pelvic operation bulged slightly when she was in the erect posture. The liver and spleen were negative there was no tenderness over the gall-bladder region, and the stomach was not dilated. Vaginal examination showed the cervix present and normal, but the uterus was not palpated. x Ray examination of her gastro-intestinal tract showed seven-hour retention in the stomach and an obstruction in the colon near the hepatic flexure, with marked distention of the ascending colon and small intestines (Fig. 23). Three days after admission examination showed the same mass in the right iliac fossa as on ad-

mission. This was rather dull on percussion at first, but could be emptied into the ascending colon by pressure, and then disappeared. Above this mass, and probably in the ascending colon, was a small mass about 3 or 4 cm. in diameter which was tender. There was also tenderness over the region of the pylorus and gall-bladder but no mass could be felt there. On August 10th, six days after admission, I opened her abdomen through a right rectus incision, freed the omental adhesions to the former



Fig. 23.—Case VII. Carcinoma of ascending colon. The barium meal distends the small intestine and caecum, but is arrested in the ascending colon.

operative scar and resected the diseased contentum. The caecum was dilated and there was a narrow annular constriction in the ascending colon about 10 cm. above the ileocecal valve resembling scirrhus carcinomae. The gall-bladder, liver and stomach appeared normal. The caecum was then freed from its attachments up to the hepatic flexure and the terminal ileum was cut across and the proximal end closed and a lateral anastomosis made between this and the transverse colon just beyond the hepatic flexure. Then the transverse colon was divided at the

hepatic flexure, the distal end closed and the cecum and ascending colon were removed. The patient was rather shocked by the operation, which lasted two hours, but reacted well by the next day and passed some flatus, retained her enterochylis, and during the afternoon took some water by the mouth, but only 15 c.c. ( $\frac{1}{2}$  ounce) of urine was obtained by catheter in the twelve hours after the operation, and the second day after operation she voided only 45 c.c. ( $1\frac{1}{2}$  ounces) of urine, and she died on the third day after operation apparently from suppression of



Fig. 24.—Case VII. Adenocarcinoma of the ascending colon.

urine and exhaustion. The specimen removed at operation showed a typical annular carcinoma of the ascending colon, with a stricture barely admitting a goose quill (Fig 24). Autopsy showed no peritonitis or hemorrhage, anastomosis in good condition but some loops of small intestine had slipped from left to right through the unsutured gap beneath the anastomosis but no obstruction of the intestines had been caused by this internal hernia, though certainly the gap should have been sutured at the time of operation. No secondary deposits of carcinoma were found.



## CASE VIII. CARCINOMA OF HEPATIC FLEXURE OF COLON: INOPERABLE

MANY of these cases of carcinoma of the large intestine, however have had sufficient warning and should have sought surgical relief sooner than they have done so. Anna B., twenty eight years of age was admitted to the Episcopal Hospital July 21 1912 on Dr Fussell's medical service. She was married and had 3 children, the youngest being thirteen months of age. She had had no miscarriages. Apart from typhoid fever at thirteen years of age her general health had always been good until shortly before the birth of her last child, when she felt weak faint, and giddy she had suffered from constant diarrhea all through the later months of pregnancy and this had persisted up to admission. She had passed no blood in her stools at any time and had no vomiting or nausea except during the later months of pregnancy and even then she had a good appetite after vomiting and sometimes when she ate again the food would be retained. Her normal weight, she said, was 186 pounds (84.2 kg.) On admission it was 125 pounds (56.5 kg.) Her chief complaint was a weak and dragging feeling. While in bed she had no pain and felt well, but as soon as she exerted herself she felt exhausted. Examination showed she was a very anemic, wasted woman, with skin and mucous membranes pale but no yellowish tinge to the skin head neck, and thorax negative, except for a soft systolic murmur at the apex of the heart which was not transmitted. The liver was not enlarged but the spleen was palpable on deep inspiration. The abdominal walls were relaxed and flabby and in the right upper quadrant there was a palpable mass the size of a kidney movable tender and rather firm in consistency. It did not seem to be connected with the gall-bladder. On August 2d Dr Fussell asked me to see her and he told me he thought it was a tumor of the right kidney but chromo-ureteroscopy done that same day by Dr B. A. Thomas, showed the indigocarmine solution eliminated



In seven minutes from both ureters, proving the kidneys functionally sufficient and the ureteral orifices appeared normal. The patient was certainly very anemic, her hemoglobin was only 36 per cent. her white blood-cells numbered 12,000 and her temperature ranged from 100° to 101° F. In the upper right quadrant was an indurated mass about the size of a large fist which moved on respiration, was dull to percussion, and was only slightly tender. There was tympanitic bowel in front of it, there was tympany between it and the liver and yet the mass did not feel to me as if it were connected with the kidney. It moved more laterally than upward and downward and was fairly freely movable under the abdominal wall.

Under ether anesthesia just before operation (August 5 1912) the tumor was found to be clearly outlined nodular freely movable in the right flank but not extending back to the region of the kidney. A transverse incision was made over the mass, and while the stomach, pylorus, and gall-bladder were normal, there were very dense adhesions, with a mass of woody hardness below the pylorus, involving the hepatic flexure. The omentum and the transverse colon appeared normal, but the appendix was not found. After packing off with gauze the mass was burrowed into on its anterior aspect, and some partially necrotic omentum was found, as well as some colon bacillus smelling moisture, but no real fluid and no pus. I abandoned the operation, putting in an iodoform-gauze drain.

The report on the excised specimen of omentum showed it was the seat of metastatic adenocarcinoma. A fecal fistula developed in the wound on the third day but in spite of this the patient felt much better with more appetite and less soreness in the abdomen. The fecal discharge continued until August 25th, when it ceased for a time under the influence of daily enemas and opium, but the patient gradually failed, and died September 20th. The autopsy showed the lower surface of the right lobe of the liver the gall-bladder duodenum and hepatic flexure of the colon were included in a large carcinomatous mass and that the fistula from the abdominal incision led into the colon through the tumor.

## CASE IX. CARCINOMA OF HEPATIC FLEXURE OF COLON; RESECTION; ILEOCOLOSTOMY RECOVERY

OCCASIONALLY however a surgeon is gratified to have a patient come to him in an operable condition. Such was the case of the Reverend R. L. S. sixty-nine years of age, who was admitted to the hospital June 22 1920. He had been a very athletic man ever since his college days, when he was a champion. He had had an operation for hemorrhoids in 1893 and was under my care in 1908 for dislocation of the hip sustained in a suicidal attempt in jumping from a second-story window. This was during an attack of melancholia, of which he had had a number

On admission in 1920 his chief complaint was intermittent, knife-like pain in the abdomen. He had been in fairly good health except for his melancholia until the winter of 1919-20 when he had a slight attack of influenza but he had had chronic indigestion for the last few years and the most obstinate constipation increasing for the last three years. Three months before admission he first had some definite pain in the abdomen and at the same time he noticed a small lump in the right side of his belly. There had been no change in his weight for the last forty years until within the past few months, when he had lost 25 pounds (11 kg.) about 15 pounds (6.7 kg.) of this being lost within the last month. The pain had been very severe, especially during the last three weeks, but always more or less intermittent. His bowels could no longer be moved by cathartics, and for the last two or three weeks he had had to use an enema daily usually 2 quarts at a time. His appetite remained good but he could not eat much because the food disagreed and caused pain.

Examination showed a poorly nourished man, so weak that he held on to the wall or the furniture in walking across the room. His weight was 107 pounds, 10 ounces (48.85 kg.) His heart was enlarged down and out with a systolic thrill and diastolic murmur



transmitted toward the axilla. His pulse was irregular there being two regular beats and then two small beats in quick succession. There was marked pulsation in all the superficial arteries. His blood-pressure was 168 systolic, 95 diastolic. Examination of the abdomen showed it was tympanitic, except for a small area on the right side. He was emaciated and peristalsis was seen occasionally. Palpation showed a mass above and to the right of the umbilicus apparently about 10 x 10 cm. in size, movable in all directions, apparently not adherent, dull on percussion. It was movable toward the left as far as the middle, but returned again of itself to the usual site. There was tympany between it and the liver and it was not tender except on hard pressure. It did not have the characteristics of fecal impaction, but was extremely hard and nodular. There seemed to be enlarged lymph-nodes palpable through the abdominal wall in the epigastric region, probably in the gastrohepatic omentum. There was a reducible left inguinal hernia, for which the patient wore a truss. His urine was normal, his blood Wassermann was negative, and his blood count showed red blood-cells 4,390,000 hemoglobin 80 per cent. white blood-cells 8400 polya. 64 per cent. x Ray examination by Dr Bromer showed that the esophagus and the stomach were normal, but that there was a filling defect in the transverse colon just beyond the hepatic flexure continuing well up toward the sigmoid flexure. This filling defect persisted in examinations both after ingestion of barium by mouth and by enema and Dr Bromer thought in connection with the history of chronic constipation it indicated a carcinoma, or other tumor involving that region.

The operation was done on June 24 1920 when I found movable mass at the hepatic flexure but adherent to the gall-bladder and duodenum. The ileum was divided above the ileocecal valve and sutured end on into the inferior longitudinal band of the transverse colon. (I am sure that it is much better plan in doing any operation of this kind to make the anastomosis first and then proceed to the excision of the growth only if the patient's condition is such as to warrant it, because after the anastomosis is made the operation can be abandoned at any

stage if necessary and concluded at a second sitting but it would not be convenient to have to abandon the operation for excision of the growth before the anastomosis was made.) The colon was then sectioned just distal to the hepatic flexure and the distal end closed with sutures and the cecum and ascending colon removed (Fig. 25). Some trouble was encountered on account of dense adhesions between the tumor and the gall-bladder and the descending and transverse duodenum and pancreas, but these



Fig. 25.—Case IX. Carcinoma of hepatic flexure of colon, specimen removed at operation.

adhesions were ligated and divided and finally the opening between the mesentery of the ileum and the transverse mesocolon was closed by suture. The abdomen was closed without drainage, the time of the operation being one hour and forty minutes.

This patient's highest pulse-rate was 92 just before the anesthetic was begun, the anesthetic being gas with only 2 ounces of ether. His highest temperature was 99.4° F. on the fifth day after operation.

July 7th he seemed convalescent. All the sutures were

removed from the wound there was a slight fecal smelling discharge on the gauze, but after this date no further discharge occurred.

July 14th he was sitting up in bed.

July 20th walking a little.

August 2d gastro-intestinal x ray study showed the esophagus and stomach normal and in the twenty-four-hour plate the result of excision of the cecum and ascending colon was shown,

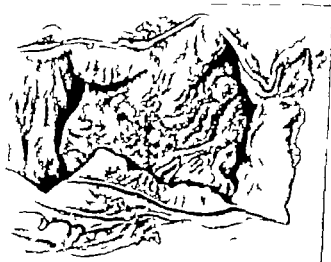


Fig. 26.—Case IX. Carcinoma of hepatic flexure of colon.

with anastomosis of the terminal ileum to the transverse colon. There was now no filling defect in the transverse colon and in the twenty-four hour plate there was no delay in the normal movement of the barium meal through the large bowel.

The patient left the hospital August 14th, his weight 114 pounds (51.3 kg) over 6 pounds (2.7 kg) more than on admission.

The laboratory report on his specimen showed that it was a medullary carcinoma of the colon, in areas adenocarcinoma with no involvement of the adjacent lymph-nodes Fig 26 is drawing

of the specimen. Examination of the specimen confirmed what I had suspected at the time of operation, that I had apparently left a small portion of colon, perhaps 0.5 cm. in diameter adherent to the transverse duodenum for after the specimen had lain in the pan for some time a little fecal discharge was found at this point from the interior of the lumen of the excised bowel. Section of the tumor showed a channel about 1 cm. in diameter the tumor being about  $2\frac{1}{2}$  cm. in thickness and about 10 cm. in length involving the entire circumference of intestine at the hepatic flexure. The lymph-nodes that were removed were in the gastrocolic omentum. No others could be found at operation.

This patient wrote me a year after operation that his weight was above normal, that he was in perfect health, that he had had no constipation or any intestinal trouble since the operation, and I am happy to say that this condition still continues at present (February 1922) over eighteen months since operation.

It is certainly true with very few exceptions, that the inoperable cases of carcinoma of the large intestine occur in those patients who have neglected fair warning symptoms, or who have been incompetently treated by ignorant physicians during the operable stage. In Case VI, where symptoms were of four days duration only neither the patient nor her physician can be blamed for not recognizing a symptomless malady. But what shall we say of the individual calling himself a "rectal specialist" who until his admission to the hospital (September 28 1916) had been treating the old man, a photograph of whose carcinomatous rectum and buttock is represented in Fig. 27. This poor old man, seventy two years of age, had faithfully and with confidence put himself into the care of the so-called specialist for what he thought was 'piles' and the ignorant if not charlatanical malpractitioner had been treating him for eight months for 'piles' and "ischio-rectal abscess." The latter he had indeed only to find the carcinoma of the rectum growing out through the ischio-rectal fossa on to the buttock.

Note also the aid derived in almost every case from roentgenologic study but remember also that there are very many

incompetent and ignorant individuals calling themselves roentgenologists who know nothing but the technical details of their trade (and often know too little even of these) and who are utterly unable to interpret what they see even if their x-ray plates or their fluoroscopic expositions are good. They may on the one hand lull the unsuspecting patient and the overconfident physician into a sense of false security because the existing lesions are overlooked or on the other they may make an erroneous interpretation pointing out disease where there is no



Fig. 27.—Condition on admission. Carcinoma of rectum treated by "rectal specialist" for eight months under the diagnosis of piles and "ischio-rectal abscess."

disease, and so the patient may be subjected to unnecessary operation.

In reaching your diagnosis make use of all the laboratory aids that are available, but keep your sound clinical judgment untrammelled. Get a clear history of the onset and progress of the malady, cross examine your patient time and gain as to suggestive occurrences or symptoms he may have forgotten, and then act before it is too late, in the light that all of art and all of science can afford.

If the case is clearly inoperable when first seen, it may yet

be possible to cause an amelioration of the patient's condition even though his disease cannot be cured. Quite apart from local treatment with radium or the x-rays I am a firm believer in colostomy as a palliative measure in inoperable carcinoma of the rectum because I know that a colostomy properly performed really palliates the patient's discomfort, and even if it does not prolong his life, makes his remaining days infinitely more comfortable. Make a left-sided McBurney incision, draw the sigmoid up into this wound and draw its proximal end taut this is to prevent an intussusception of the afferent loop occurring after operation. Then suture your afferent and efferent loops together like a double-barreled shotgun (*"en canon de fusille"* as the French call it) uniting them for a distance of 10 cm. if possible. This forms a firm spur which will last until the patient's death, and will prevent fecal discharges from continuing past the false anus to irritate the tumor in the rectum. Then reduce your loop of sigmoid until the apex of its mesentery lies level with the peritoneum and suture the parietal peritoneum around both coils of bowel at this level, placing a rubber tube across the mesentery to prevent the coil from retracting entirely within the abdomen. Dress the wound and two or three days later if there is no acute obstruction demanding immediate relief you may open the bowel without any anesthetic by cutting transversely across the projecting loop of sigmoid, preferably with the actual cautery. Cut all the way through to your rubber tube and remove the latter. It is a simple and efficient operation but to promote the patient's comfort the bowel must be well taken care of afterward, and when this is done no colostomy apparatus is required, and the patient is entirely inoffensive to himself and to those about him. I must confess to reading with considerable surprise of the various "modifications" and "improvements" on this simple operation which are from time to time reported in the current journals and I hear with regret of patients who have been operated on by some of these latest methods, who are so uncomfortable themselves, in spite of the use of the most approved and most widely advertised colostomy apparatuses, and who are so offensive to their family that both patient and



family eagerly await the former's transition beyond that bourne from which no traveler returns.

For it is a fact that when the method of colostomy which I have just described, and for the merits of which I think most credit must be given to Tuttle of New York—when this method is employed, I say and when the bowel is properly cared for, it is satisfactory in every way and the patient is required only to wear a gauze pad over the opening and to change it once or at

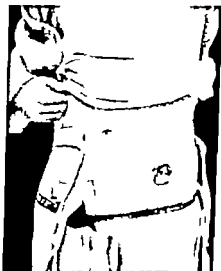


Fig. 28.—Case of colostomy for inoperable carcinoma of rectum. Three weeks after operation. Note also trace for right inguinal hernia, very frequent complication of chronic obstruction.

the most twice a day (Fig. 28). And how is the bowel to be cared for do you ask? If each morning the colon is thoroughly filled through the afferent loop by 500 to 1000 c.c. of warm water and if this injection is retained for about twenty minutes, free evacuation of the bowel is secured by turning face downward and making pressure over the cecum and I can testify from repeated personal observations to the truth of Sir Frederick Wallis's assertion that the patient is then quit comfortable and clean for the rest of the day.

## CLINIC OF DR. CHARLES H. FRAZIER

### UNIVERSITY HOSPITAL

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#### BRAIN TUMORS IN RELATION TO THE CEREBROSPINAL FLUID AND VENTRICLES

It is quite impossible to comprehend many of the problems that have to do with the diagnosis of intracranial lesions or with their surgical treatment without an intimate understanding of the physiology—the pathologic physiology—of the cerebrospinal fluid and the cavities within which it is contained. This general statement applies not only to an understanding of the symptomatology and behavior of brain tumors, to their diagnosis, but also to many practical problems as they present themselves on the operating table.

Let me be more explicit. The papilledema, the headache and vomiting of brain tumor are evidences of increased intracranial tension, and this increased intracranial pressure is not due alone to the presence of the tumor but in the majority of instances in a large measure to the dilatation of the ventricles. This dilatation of the ventricles—call it internal hydrocephalus if you will—is, I might say an invariable accompaniment of all tumors of the posterior fossa. One can understand how readily a tumor in this locality particularly in the cerebello-pontile angle a favorite site, even though of small dimensions could obstruct the outlet to the ventricles. I say invariable accompaniment there are, of course exceptions to all rules. There happens to be in the hospital today a striking exception. Here is a patient whose tumor history extends over a period of at least eight years. Four years ago I removed from the right posterior fossa an endothelioma so large that it had re-

Lecture to the Surgical Group of the Post-Graduate School of Medicine of the University of Pennsylvania.

placed an entire cerebellar hemisphere. In spite of the fact that the tumor was so large there was at that time not the slightest evidence of a papilledema. It is of further interest to note that a year ago she returned with evidences of a recurrent growth which upon exploration, I found inoperable. But even then there was no choking of the disks. This patient has been treated by radium in the first instance by direct implantation, and later by the indirect method, and there is no doubt in the mind of her family or of her medical attendants that there has been a very decided improvement. When I tell you that the patient had a staggering gait you can see for yourselves, as the patient walks across the clinic floor how much she has improved. One hears and reads skeptical views as to the effect of radium but I venture to say that if you inquire into the experience of those who have expressed these views, you will find that, in the first place, they never had any radium themselves, and in the second place they have had no experience with it. Although this is not germane to our main theme, I wish to say quite emphatically that from an experience now including a large series of cases I have very strong conviction that radium does retard the growth of brain tumors, and that it has proved an invaluable agency in the treatment of certain inoperable cerebral neoplasms.

To return now to our original theme, while, as I have said, internal hydrocephalus is an almost invariable accompaniment of subtentorial tumors, it is also observed in pretentorial growths, especially those at the base so situated as to readily obstruct the ventricular outlets. Here for example is a patient, now under observation, who has unquestionably an internal hydrocephalus and who, we believe, has a tumor at the base of the occipital lobe. Observe the cerebral hernia beneath the right temporal muscle. I will not go into this patient's history in great detail save to say that when he came to us a month ago he was bedridden, suffering intensely from headache and vomiting with a papilledema in each eye of three diopters. Merely to relieve his subjective disturbances and to conserve vision while he was under observation a subtemporal decompression

was performed with most gratifying results. The operation has controlled the vomiting, relieved the headache, and the choked disks have subsided. The patient has thus been transformed from one bedridden and with many discomforts to one ambulant and practically free from any subjective disturbances. I want you to note while he is here (I will bring him before you later on) that the cerebral hernia at the site of the decompression is under great tension.

Finally with regard to internal hydrocephalus and tumors even in the absence of obstruction, such as might be caused by tumors at the base there is an internal hydrocephalus, perhaps of more moderate degree, in tumors of the cerebral hemispheres which do not obstruct ventricular drainage. Just what disturbs the balance between the secretion of and absorption of cerebrospinal fluid in the presence of a brain tumor I am not prepared to say. That this balance is disturbed I have no doubt, so that practically in all cases of brain tumor wherever situated one has to reckon with an internal hydrocephalus.

Before applying to the practical problems of diagnosis or technic what we know of the cerebrospinal fluid in its perverted state, let me review some of the fundamental facts concerning its origin, circulation, and absorption.

First of all, let me remind you that the cerebrospinal fluid is in large measure (90 per cent. possibly more) the product of the choroid plexus. I call it product, although we know little of the process by which it is formed. How rapidly it is formed under normal circumstances we do not know but it is quite certain that under abnormal conditions the rate of production is greatly increased and that the process of production, whatever that may be, is readily influenced by deviations from normal.

I show you this patient who had, we presumed a basal tumor with ventricular obstruction. I had performed an exploratory craniotomy and the flap was raised above the surface by the distended ventricle. By direct ventricular puncture I could readily withdraw 60 c.c. of cerebrospinal fluid and the osteoplastic flap at once returned to the level of the skull. Within

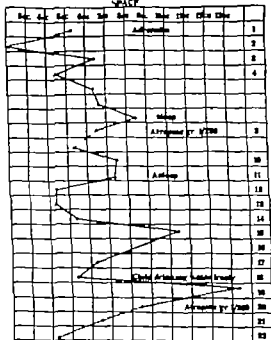
placed an entire cerebellar hemisphere. In spite of the fact that the tumor was so large there was at that time not the slightest evidence of a papilledema. It is of further interest to note that a year ago she returned with evidences of a recurrent growth which, upon exploration, I found inoperable. But even then there was no choking of the disks. This patient has been treated by radium, in the first instance by direct implantation, and later by the indirect method, and there is no doubt in the mind of her family or of her medical attendants that there has been a very decided improvement. When I tell you that the patient had a staggering gait you can see for yourselves, as the patient walks across the clinic floor how much she has improved. One hears and reads skeptical views as to the effect of radium, but I venture to say that if you inquire into the experience of those who have expressed these views, you will find that, in the first place they never had any radium themselves, and in the second place, they have had no experience with it. Although this is not germane to our main theme I wish to say quite emphatically that from an experience now including a large series of cases I have very strong conviction that radium does retard the growth of brain tumors, and that it has proved an invaluable agency in the treatment of certain inoperable cerebral neoplasms.

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but it would seem to indicate that the rate of secretion is influenced by a number of factors (Fig 30)

Much of what we know about the production of cerebrospinal fluid has been derived from experimental research. I directed a few years ago an elaborate investigation as to the

RATE OF FLOW OF CEREBROSPINAL FLUID IN CASE OF FRACTURE OF THE BASE OF THE SKULL WITH RUPTURE OF THE TYMPANIC MEMBRANE AND DIRECT CEREBRAL EPM WITH THE SUBARACHNOID SPACE



Each period represents thirty minutes. The number of cc. collected in each thirty minutes observed. Note fall after administration of adrenalin and atropine, rapid rise after large draughts of water.

Fig. 30—Illustrating variation in rate of flow of cerebrospinal fluid in case of fracture of the base of the skull.

factors which influenced the rate of flow of cerebrospinal fluid or the activity of the choroid plexus. We were looking particularly for some agent which would retard the rate. With one exception all the drugs, tissue, and glandular extracts used were followed by a transitory increase. The one notable excep-

two or three hours this amount of fluid would be replaced, as evidenced by the elevation of the flaps and the renewed signs of pressure. At this rate 720 c.c. of fluid would be secreted in a day (Fig. 29). There is in this crude demonstration a lesson to be learned. Frequently physicians write me as to the propriety of practising ventricular puncture through a decompression opening, when the hernia is increasing in size and the tension



Fig. 29.—In case of inoperable tumor of the cerebral hemisphere the distended ventricle has elevated the osteoplastic flap considerably above the level of the skull. By direct ventricular puncture and evacuation of the ventricle the flap could readily be replaced to its normal relationship. While two hours the ventricle would refill.

becomes excessive with aggravation of symptoms. The answer at once suggests itself to you. The relief afforded under such circumstances would be only a matter of a few hours.

To illustrate the extreme variability of the rate of production and the response to varying conditions take this case of fracture of the base of the skull with rupture of the tympanic membrane. The fluid was collected from the external ear the amount recorded and charted. This is a rather crude demonstration,

tion was thyroid extract. In every instance thyroid extract caused a definite retardation of flow not transitory continuing over a period of several hours (Fig 31-35)

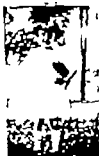
Has this phenomenon, you ask, any practical application? Theoretically yes, in non-obstructive congenital hydrocephalus. Unfortunately I have been able in but one case of congenital hydrocephalus to supervise the administration of thyroid

#### HYDROCEPHALUS

L. J. May 1914 Wal. Reilly Hospital



At the 18 months



At the 6 1/2 yrs



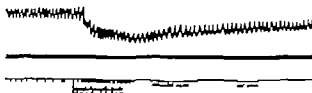
the 20th month.

Fig 36—Photographs of patient who developed non-obstructive hydrocephalus shortly after birth. Thyroid extract was administered for six months. At the age of six the evidences of hydrocephalus had disappeared.

extract over a sufficiently long period. In this case the treatment was begun when the child was five weeks old and con

Figs. 31-35—In this research number of agents were found which accelerated the flow of cerebrospinal fluid. Figure 31 represents an increase following the injection of aurochlorate, and Fig 32, of brain extract. The only agent which retarded uniformly and for number of hours the flow of cerebrospinal fluid was thyroid extract. Figures 33-35 represent this retardation in single experiment.





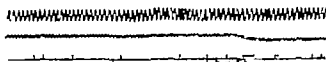
Injection of 5 ml. Amyl nitrite. Marked increase in outflow with fall in blood pressure. Fluid sucked back.

Fig. 31.



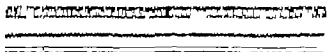
5 c. brain extract injected C.S.F. stimulated. Then considerably slowed.

Fig. 32.



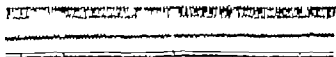
5 cc Hansen Thyroid extract. Drop in blood pressure with slight stimulation.

Fig. 33.



40 minutes after above chart. Still flowing extremely slow.

Fig. 34.



Continuation of above. Flow much slower than normal.

Fig. 35.

ventricles by their several outlets to the subarachnoid space, to the cisterna cerebello-medullaris or the cisterna magna, the distributing center of the cerebrospinal fluid system. The accumulation of fluid in this cistern has been availed of for the practice of cisterna puncture, a substitute for lumbar puncture proposed by Ayer (Fig. 37). A small quantity of fluid passes from the basal cistern into the spinal canal, but the bulk makes its way through the incisura tentorii to the subarachnoid space over the cerebral hemispheres where it is taken up by the arachnoid villi. A relatively small quantity is absorbed in the spinal canal or escapes from the cranial chamber by the lymphatics or beneath the sheaths of the cranial nerves. But the amount through these several channels is insignificant. The great mass is absorbed by the arachnoid villi over the cerebral hemispheres. Hence, when there is any obstruction to the circulation, either at the outlet of the ventricles or at the passage through the tentorium, the fluid will accumulate to such excess as to give rise to serious consequences. The causes of obstruction are either the adhesions of an inflammatory process or new growth.

From this very cursory review of certain fundamental facts regarding the cerebrospinal fluid in normal and abnormal environments I want to draw some practical lessons in relation particularly to brain tumors.

Consider for a moment the operation subtemporal decompression, once heralded with a great deal of enthusiasm as an operation promising much to the patient with an inoperable growth, no matter where located. When a hernia develops at the site of subtemporal decompression, does that represent the increase in bulk within the skull caused by brain mass plus tumor? Only to a limited degree in most instances the size of the hernia is in proportion to the degree of ventricular distention. In other words, the space presumably provided for tumor growth is largely preempted by the dilating ventricle. This young man (Fig. 38) was sent to me for an opinion. You see he has a large cerebral hernia in the right subtemporal region. Now we know for we have just completed a ventriculo-

tinued faithfully by the parents for six months. The child is now to all intents and purposes normal, quite comparable mentally and physically to her two sisters. A photograph of the patient at various ages is shown in Fig. 36.

You should remember that the normal pressure of the cerebrospinal fluid as measured by the mercurial manometer is 6 to 8 mm.

From the practical point of view we are more concerned with the process of absorption. There is, of course a regulatory

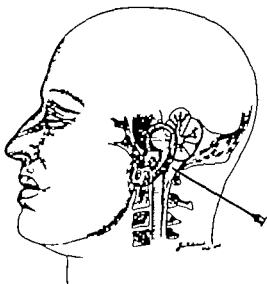


Fig. 47—Illustrating the technic of lateral puncture (Courtesy of Dr. James B. Ayer)

mechanism, under normal conditions, whereby the balance between secretion and absorption is maintained. We have already spoken of conditions which affect the secretion, but what disturbs the rate of absorption? To answer this question you must recall to mind these facts: that the fluid is formed in the lateral ventricles, that the ventricles are mere receptacles, as the urinary or gall-bladder; that the fluid escapes from the

ventricles by their several outlets to the subarachnoid space, to the cisterna cerebello-medullaris or the cisterna magna the distributing center of the cerebrospinal fluid system. The accumulation of fluid in this cistern has been availed of for the practice of cisterna puncture, a substitute for lumbar puncture proposed by Ayer (Fig 37). A small quantity of fluid passes from the basal cistern into the spinal canal but the bulk makes its way through the incisura tentorii to the subarachnoid space over the cerebral hemispheres, where it is taken up by the arachnoid villi. A relatively small quantity is absorbed in the spinal canal or escapes from the cranial chamber by the lymphatics or beneath the sheaths of the cranial nerves. But the amount through these several channels is insignificant. The great mass is absorbed by the arachnoid villi over the cerebral hemispheres. Hence, when there is any obstruction to the circulation either at the outlet of the ventricles or at the passage through the tentorium the fluid will accumulate to such excess as to give rise to serious consequences. The causes of obstruction are either the adhesions of an inflammatory process or new growth.

From this very cursory review of certain fundamental facts regarding the cerebrospinal fluid in normal and abnormal environments I want to draw some practical lessons in relation particularly to brain tumors.

Consider for a moment the operation subtemporal decompression, once heralded with a great deal of enthusiasm as an operation promising much to the patient with an inoperable growth, no matter where located. When a hernia develops at the site of subtemporal decompression, does that represent the increase in bulk within the skull caused by brain mass plus tumor? Only to a limited degree in most instances the size of the hernia is in proportion to the degree of ventricular distention. In other words, the space presumably provided for tumor growth is largely preempted by the distating ventricle. This young man (Fig 38) was sent to me for an opinion. You see he has a large cerebral hernia in the right subtemporal region. Now we know for we have just completed a ventriculo-

gram in this case that this hernia is essentially a hernia of the ventricle and in all probability the tumor is a posterior fossa tumor. I presume in this case a subtemporal decompression was performed because of the obscurity of the lesion, but had the doctor who performed the operation suspected a posterior fossa growth he should have performed a suboccipital rather than a subtemporal decompression for obvious reasons. Here are two lessons to be learned. First, do not perform subtemporal



Fig. 38.—Patient referred to the clinic with large cerebral hernia at the site of subtemporal decompression. Our investigation disclosed subtemporal lesion.

decompressions in posterior fossa lesions second, do not fall into the habit of resorting to the subtemporal decompression without clear indications. Too often the operation is performed because the attending surgeon does not feel competent to engage in a complicated exploration and shrinks from the more hazardous of the two procedures, or because the conditions essential for an exhaustive study are not at hand and a localization of the growth has not been attempted. There should be no question, then, in your mind as to the impropriety of subtemporal

decompression in posterior fossa tumors. But what of pre-tentorial growths? Horsley many years ago advised decompression directly over the growth, and when we see on the operating table a tumor of the cerebral hemisphere that we regard as inoperable, we should follow Horsley's directions. Of course in unlocalizable growths the right subtemporal region is the site of election.

The extensive accumulation of cerebrospinal fluid sometimes within and sometimes without the ventricles, has led to errors in diagnosis. "Pseudotumor" is a term which has crept into the medical nomenclature and is self-explanatory. Whether the term is or is not an appropriate one we see a number of cases having the earmarks of an intracranial growth both general and focal. The subsequent course of events or perhaps an exploratory operation makes our original diagnosis untenable. The underlying pathology in those cases is an arachnitis, general or local, following a systemic infection, exanthemata in children or influenza in the adult. The presence of adhesions may cause ventricular obstruction, or if limited to a given area may eventuate in a localised cyst. This child (Fig. 39) for example, had signs of increased intracranial pressure there were no focal symptoms. A subtemporal decompression relieved the head ache and vomiting, but, unfortunately optic atrophy was so far advanced that the child was blind. Many years have passed since this operation was performed, and with the exception of loss of vision the child is entirely well. This tragedy might have been averted had the operation been performed sooner—a very striking example of the urgency of early decompression in doubtful cases. Contrast this case with that of this young lady who had all the signs of intracranial pressure plus evidence suspicious of a cerebellar lesion. There was a beginning papilloedema, but the disks were not atrophic. Three years have elapsed since the operation she has completed her course in college and is now symptom free. I could cite other examples of these so-called pseudotumors, but these are sufficient for our purpose.

Another source of error in diagnosis attributable to the ex

cessive accumulation of the cerebrospinal fluid, in this instance in the ventricles, is the suggestion of a frontal lobe picture. One can readily see how a distended ventricle by pressure upon the frontal lobe might disturb its function. This patient we know from our examination had an internal hydrocephalus—we know furthermore that the lesion was subtentorial rather

FIGURE 39

L. S.      File No. 10384      1913  
*Protoplasma diaphanum*    Brain tumor    No localization  
 General symptoms    Headache    convulsions    paralysis, secondary atrophy



Brain removed after  
decompression 1913



Head as in size of normal  
years later 1917



Fig. 39—Upper left. A subtemporal decompression as presumptive tumor. Upper right. Five years later the disappearance of the cerebral hernia and the complete recovery with the exception of the optic atrophy precluded the possibility of cerebral growth. Lower center. The dilatation of the ventricle is the hernia of subtemporal decompression.

than tentorial, but there were two symptoms which, had there not been other conflicting signs, might have justified a localization in the frontal lobes loss of memory and what the Germans appropriately call *Witzreichtum*. Both these symptoms were conspicuous features in the clinical picture but were readily accounted for in the manner described.

Again, dilatation of the fourth ventricle from an obstructive lesion may lead us astray. The proximity of Deiter's nucleus to the fourth ventricle is responsible we believe, for

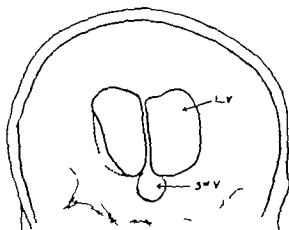


Fig. 40.—Anteroposterior view of dilated ventricles.

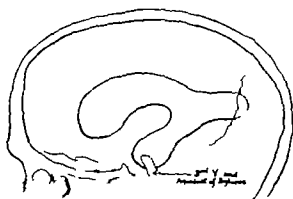


Fig. 41.—Obliteration of posterior horn of left lateral ventricle. Markedly dilated ventricle. N. air below aqueduct of Sylvius. (Same case as Fig. 40.)

erroneous deductions from disturbance of function as elicited by the Bárány test. This is not an infrequent source of error and should be guarded against.



**Ventriculography**—This leads me to discuss with you the question as to whether we can derive any information of practical value from the ventriculogram. You are already familiar with

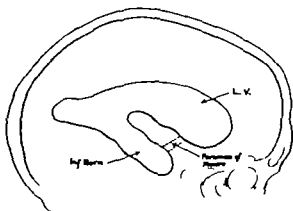


Fig. 42.—Same case as Fig. 40. Ventricle on other side. Distention, but no distortion. Third and fourth ventricles not seen. No air below third ventricle, which may be obliterated by tumor.

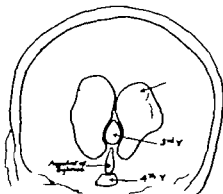


Fig. 43.—Distention and distortion of left lateral ventricle in case of occipital pole tumor. Third ventricle, aqueduct, and fourth ventricle all seen.

this method of demonstrating in the roentgenogram the outlines of the ventricles. Here is the roentgenogram of a case in which there was a rather complex clinical picture there were clearly

signs of increased intracranial pressure, but the precise localization of the growth was problematic as between a pretentorial or subtentorial growth. You see the ventriculogram (Figs. 40-42) presents in the lateral view enormously distended ventricles and,

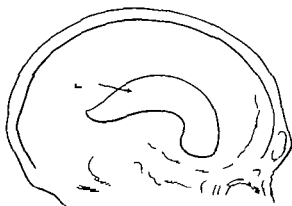


Fig. 44.—Complete occlusion of posterior and inferior horn of left lateral ventricle by large occipital pole tumor pushing upward and inward. (Same case as Fig. 42.)

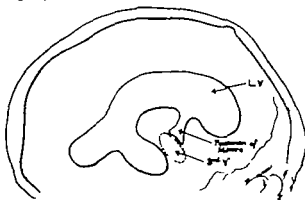


Fig. 45.—Right ventricle. (Same case as Figs. 43, 44.)

what is especially important, in the anteroposterior view a symmetric enlargement of the ventricles. One would deduce from this a tumor of the brain stem so situated as to cause obstruction to the ventricular outlet.

Contrast that with this roentgenogram the left ventricle distended moderately the right encroached upon (Figs. 43-45). This might be interpreted not only as suggesting, first, that there was a tumor of the *right hemisphere*, and second, that the tumor was subcortical rather than cortical. Naturally the

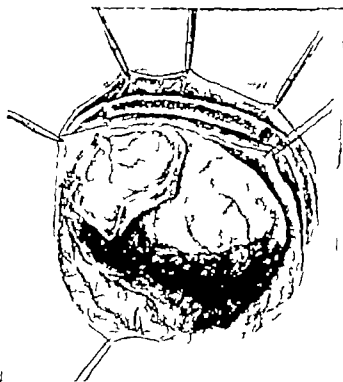


Fig. 46.—A large cortical encapsulated endothelioma in process of removal.

more deeply seated the tumor the more likely will it encroach upon the ventricle. So that we may derive information which may be helpful in these two particulars, first as to the hemisphere involved, that is right or left, and second, as to whether the tumor is subcortical. Of what practical value the ventriculogram will

be considered from the standpoint of surgical accomplishments remains to be seen. The majority of these obscure tumors are deep seated and a much larger majority are infiltrating gliomata. The favorable growth for radical extirpation is a tumor such as this (Fig 46) removed in the clinic a few days ago. It was cortical in origin and location and encapsulated, so that from the standpoint of accessibility and of the possibility of complete extirpation it was an "operable" growth in every sense of the word. Not so with the subcortical glioma, which in most instances is distinctly "inoperable."

**Problems On the Operating Table.**—By no means in all but in most cases of cerebral or cerebellar growths the intracranial pressure is greatly increased, and under these circumstances an exploration satisfactorily and properly safeguarded, can be carried out only when the tension can be reduced to within limits approaching normal. You know from what has preceded, that increased pressure is due not to the tumor alone, but in large measure to ventricular distention. Hence to relieve pressure cerebrospinal fluid must be withdrawn in sufficient quantities. Lumbar puncture is not appropriate for two reasons. In the first place if there is ventricular obstruction the ventricle cannot be evacuated by lumbar puncture, and in the second place, lumbar puncture is not unattended with risks. There are occasions when one may have no choice as in this case (Fig 47) where the ventriculogram, previously taken, showed that the ventricles were collapsed. Here there was no alternative not until after the osteoplastic flap had been reflected but before the dural incision was made 15 c.c. were withdrawn by lumbar puncture the tension immediately subsided and a large growth, a tuberculoma was removed. Obviously the dangers of lumbar puncture are not so great in pretentorial growths particularly after the flap has been reflected. Under these circumstances the conditions provocative of the much-dreaded foraminal hernia do not maintain.

In posterior fossa tumors, as a matter of routine, preliminary to the dural incision one resorts to a ventricular puncture to relieve pressure. As the ventricles are dilated this is not difficult

of performance. The cannula is introduced through a perforation 4 cm. above the occipital protuberance and 2 cm. to one side of the median line. The cannula is introduced in a direction slightly upward and at a distance of 4 to 5 cm. should enter the ventricle. In pretentorial growths one has the choice of two methods of

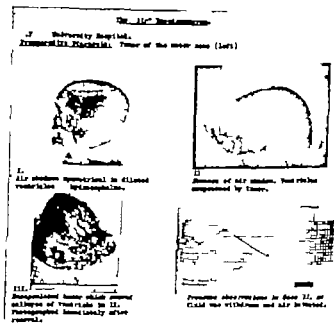


Fig 47—An attempt at evacuation of fluid by ventricular puncture failed—the first stage of an exploratory operation. A ventriculogram (upper right) taken week later explained the failure. There are no air shadows, hence the ventricles were collapsed. The reproduction (upper left) is introduced for contrast to show the air shadow in the ventricles of another case.

evacuating the ventricles, either by callosal puncture or by direct puncture of either the anterior or posterior horn.

**Dehydration by Sodium Chloride.**—Continuously in this discourse we have been confronted with the problems involved in the disturbance of the cerebrospinal fluid as related to the surgery of brain tumors. It has been the theme of this lecture

and it leads me to bring to your attention one of the more recent contributions to our aids in diagnosis and in the practical problems on the operating table, namely the employment of sodium chlorid. I will not describe the laboratory experiments of Weede and McKibbin, to whom we are indebted for this extremely interesting phenomenon, suffice it to say that by the administration of the sodium chlorid either intravenously or by mouth, there is a shrinkage of brain volume and absorption of cerebrospinal fluid. One may give from 80 to 100 c.c. of a 15 per cent.

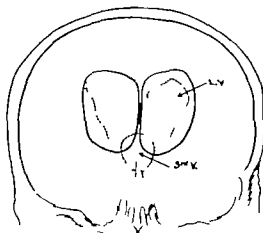


Fig. 43.—Markedly dilated ventricles without distortion or displacement in case of cerebellar tumor. N. air in fourth ventricle.

solution intravenously or 15 grams in capsules by mouth in from fifteen minutes to an hour and a half.

I bring before you again this patient who at the beginning of the lecture, you recall had a large hernia at the site of a subtemporal decompression. Meanwhile he has received 80 c.c. of sodium chlorid intravenously with the result, as you see, that the hernia has been reduced in size and the tension before extreme, has been materially reduced. Of what practical value is this demonstration? To answer that question I must tell you that the effects of the administration are much more striking when the fluid is free in the subarachnoid space, in the cisterns

or ventricles, than when the fluid is in the brain tissue as in an edema. Hence when we see the rapid reduction of a hernia in

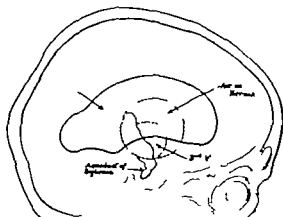


Fig. 49.—Dilated right lateral ventricle in same case as Fig. 48. Irregular enlargement of lateral and posterior horns probably due to subtemporal decompression and hernia. Air is checked at entrance to fourth ventricle.

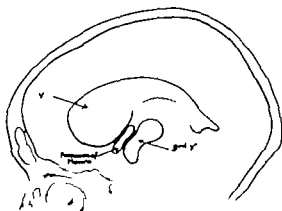


Fig. 50.—Left lateral view of same case as Figs. 48 and 49. Posterior part of left lateral ventricle obliterated. No air in fourth ventricle. Greatly enlarged third ventricle.

size and tension we assume that the hernia is in large measure due to ventricular distention. In this case this deduction has

been confirmed by the ventriculogram (Figs. 48-50) which shows an enormous enlargement of both ventricles.

This, then, is one of the practical applications of sodium chlorid therapy—that is a differentiation after a subtemporal decompression between intracranial pressure due, on the one hand, to increase in brain bulk, on the other to an internal hydrocephalus. We have used it for other purposes, as a means of

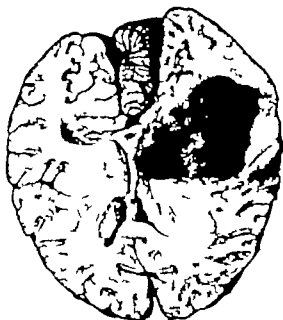


Fig. 51—A subcortical glioma regarded as inoperable.

relieving excessive headache or to meet the emergency in threatening signs of medullary pressure. And in the latter connection let me again remind you that sodium chlorid encourages absorption of fluid free rather than those bound. In the latter respect as in the edema so grave in its consequences, either complicating trauma or subcortical glioma sodium chlorid has not in my hands proved efficacious. To all intents and purposes so far



as I have been able to observe, it has been utterly inert. Here is a brain with a large subcortical glioma (Fig 51) At the exploratory operation the convolutions were found flattened, the ventricles evidently collapsed those findings, considered with the clinical picture, were sufficient to establish a diagnosis of a

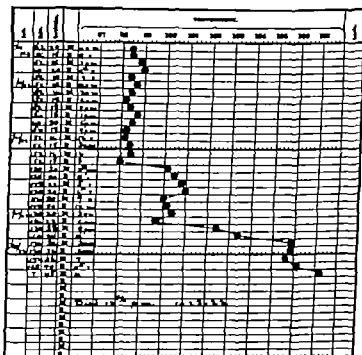


Fig 52 —The sudden rise of temperature immediately preceding fatal issue after exploration of subcortical decompression in subcortical glioma.

subcortical growth, presumably glioma. A cortical incision 3 cm. deep failed to reach the tumor 1 cm. further and the tumor would have been seen. But, as you see, the tumor is inoperable an infiltrating ill-defined growth that could not have been removed *in toto*. Although the exploration was of itself well borne by the patient, I predicted an unfavorable outcome. I forecast the

development of stupor from twenty-four to forty-eight hours after the operation, a sudden rise in temperature, circulatory and respiratory disturbances of central origin, and a fatal issue. This chart (Fig. 52) tells the story and the autopsy confirmed my apprehension. Now it is presumed that disasters such as these are the result of a spreading edema, and did sodium chlorid promote the absorption of the fluid of an edematous brain this patient's life might have been saved.

Of real value and assistance is the employment of sodium chlorid in the course of an exploratory operation where the intracranial tension is so great as to embarrass the operator either in his search for the tumor or in his closure of the wound. Had you been present a few days ago at the operation upon this patient you would have seen a practical demonstration of the usefulness of sodium chlorid under these circumstances. There was a reasonable doubt as to whether this was a tumor of the occipital lobe involving the visual cortex, or a tumor involving the optic tracts at a lower level. An inspection of the occipital lobe excluded the former but at the conclusion of the exploration, as happens not infrequently in deep-seated lesions, there had been an increase in brain volume and the dural flap could not be replaced and sutured. The introduction intravenously of 50 c.c. of a 15 per cent. sodium chlorid solution accomplished the result anticipated. The brain volume was reduced sufficiently to make it possible to close the dural incision without difficulty. Here there was an example of the conversion of an insuperable obstacle to wound closure into a simple uncomplicated procedure.

There is no need, I take it, for further demonstration to impress upon you the important part played by the excessive accumulation of cerebrospinal fluid in the ventricles, cisterns, and subarachnoid space generally in the symptomatology, diagnosis, and prognosis of brain tumors. Clinical citations have been made illustrative of these several aspects of brain tumor observations. But of no less importance are the lessons to be learned as how best to deal with the cerebrospinal fluid in the problems of intracranial exploration.

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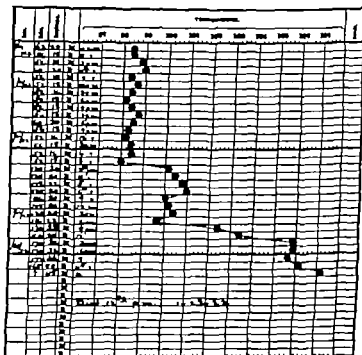


Fig 52.—The sudden rise of temperature immediately preceding fatal issue after exploration of subtemporal decompression in subcortical gliomata

subcortical growth presumably glioma. A cortical incision 3 cm. deep failed to reach the tumor 1 cm. further and the tumor would have been seen. But, as you see, the tumor is inoperable an infiltrating ill-defined growth that could not have been removed *in toto*. Although the exploration was of itself well borne by the patient, I predicted an unfavorable outcome. I forecast the

## CLINIC OF DR. BROOKE M ANSPACH

### JEFFERSON HOSPITAL

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#### LACERATED CERVIX WITH EVERSION; RELAXED PERINEUM; RETROFLEXIO-VERSION OF UTERUS IN YOUNG CHILD-BEARING WOMAN

THIS patient's "baby" is twelve years old we asked her whether she wanted any more children, and she said, any more would be a surprise. Then we told her there were two ways in which she might be treated—one was by operation and the other was by using a pessary. She at first decided in favor of a pessary but after one visit to the office she changed her mind and preferred an operation. Before coming to the hospital she had eased up in her social and other activities and felt much better. Then she was in doubt whether she wanted anything done. We let her decide the matter with the warning that when she resumed golf and driving an automobile the old symptoms would come back. It is easy to forget the ills of the past it is hard to elect an operation when you feel well yet that is the ideal time.

As a rule we would not advise operation on the cervix or the perineum or the ligaments of the uterus in a woman twenty eight years old. When there is every reason to expect two or three subsequent pregnancies such operations are undesirable provided the patient can be made comfortable with a pessary. Most women may be carried through their reproductive period with entire comfort. At the approach of the menopause operation is indicated to give them permanent relief and to prevent trouble in later years.

Now the pessary of course in some women is unsatisfactory. We do not know of anything that requires a more thorough understanding of the mechanics involved than the fitting of a



is so great that a pessary cannot be worn comfortably or the uterus is adherent, or there are adnexal complications.

**Plastic Operation.**—In plastic operations on the young child bearing woman one important point is to remove very little of the mucosa. If one takes away as much mucosa as was done in the old-fashioned Emmet operation the woman is almost sure to have another tear when she has another baby. The mucosa is so much diminished in extent that it cannot stretch to a sufficient degree but if there is a minimum of denudation while the muscles and the fascia are brought together in the depths of the wound, the predisposition to laceration subsequently is distinctly less.

It would be an excellent plan for every woman at the finish of her child bearing period to have all disabilities in the reproductive tract corrected. This might spare a certain number of women the horrors of malignant disease, and it would surely save a lot of them the discomforts of prolapse late in life.

**Round Ligament Suspension.**—There are several operations which may be used to correct displacement of the uterus so that it is important to bear in mind the indications and advantages of each one. These operations are done for the purpose of suspending the uterus by the round ligaments and increasing the efficiency of the uterosacral ligaments. We get the intestines out of the pelvis by gravity and place between them and the pelvis some folds of gauze, taking care to avoid any undue pressure, as this sometimes causes postoperative ileus adynamic ileus, so called. We do not keep the patient in the Trendelenburg position any longer than absolutely necessary the Continental operators years ago found that a very frequent cause of shock after operation was hypertension or dilatation of the right heart due to a prolonged elevation of the pelvis and the use of large quantities of salt solution.

Shortening of the round ligaments extraperitoneally by Simpson's plan is the operation which we prefer. It makes use of the strongest part of the round ligament, viz. the inner part, that part nearest the uterine cornu the outer part of the ligament—the tendinous or the fibrous—does not undergo so

pessary. But skill in doing it is easy to acquire. We constantly see cases in which the pessary has been tried and the results have been unsatisfactory because first of all the uterus was never properly replaced, or the pessary was not exactly right in size and shape or the patient did not return periodically for observation. When the opposite conditions obtain, the patient is greatly benefited and we have never seen it do the least harm.

No matter how well an operation on the round ligaments may be done one cannot expect to improve on nature and it is possible that if the woman has another pregnancy she may have a recurrence of her displacement. So you might go on *ad infinitum* operating after every pregnancy. A different but a most excellent plan which may cure the patient without abdominal section is feasible in the young child-bearing woman. Fit her with a pessary and let her wear it until five months' gone in the next pregnancy after delivery say within a week, do a perineorrhaphy if that is required. A week later have the patient begin to take the knee-chest position twice a day for fifteen minutes at the end of three weeks put in the pessary that she used before the one that you know fits her. In this way the displacement may be cured without any abdominal operation and possibly with no more than an additional week in bed.

Our attitude should be much the same relative to the lacerated cervix during the child-bearing period *i. e.* avoid operation if you can. It is well known that a woman in labor who has had an operation on the cervix gives us something to think about in addition to the ordinary problems of labor. The cervix that has been repaired or amputated, and in which there is more or less scar tissue often dilates or is dilated with difficulty and may prove a source of considerable dystocia in the first stage of labor.

During the child-bearing period surgical operations on the reproductive tract should be avoided. Of course there are certain cases in which operation is imperative as, for example when there is eversion of the cervical mucosa and hypersecretion, so that the vagina and the vulva are almost constantly bathed with leukorrheal discharge, or when the relaxation of the perineum

to the posterior surface of the uterus. The uterus is supported by the weaker part of the round ligament, the outer tendinous part, which, as we have said does not hypertrophy so much in the early part of pregnancy nor undergo involution so well during the puerperium. However if the ovaries are prolapsed the Webster Baldy operation is of value for it supports the ovary better than any other. Nevertheless, its disadvantages outweigh its advantages. If one fixes the ligaments under much tension the patient is almost sure to complain of backache in attaching the ligament to the posterior surface of the uterus. If one impedes the ovarian circulation there may be edema and swelling of the ovary and this, with the needle holes on the posterior surface of the uterus in a certain proportion of cases, results in postoperative adhesions.

You may have noticed that we put a rectal tube in position before starting the abdominal section while the incision is being closed, the nurse, without disturbing the dressings, etc., runs into the bowel 2 pints of a 2 to 4 per cent. solution of sodium bicarbonate. Bicarbonate of soda is preferable to sodium chlorid since it is more effectual in the prevention of postoperative acidosis. We use it freely in any case in which this dangerous complication seems imminent.

In addition to the round ligament operation in some cases it is a very great help to shorten the uterosacral ligaments. These vary considerably in development they usually consist of peritoneal folds enclosing connective tissue and run from the posterior surface of the uterus at about the position of the internal os around the pouch of Douglas to the peritoneum covering the sacrum. The operation is very simple, the only difficulty being the exposure, which of course, depends upon the Trendelenburg position and a good light. There are two things to be avoided first, in picking up the peritoneal folds one must be careful lest by any chance he catches the ureter second, in tacking the ligament to the uterus one must not puncture any of the broad ligament vessels. The last is readily avoided by sticking close to the median line. If one goes to either side troublesome hemorrhage may occur. Uterosacral shortening is



much hypertrophy early in pregnancy and does not, therefore, undergo so much involution during the puerperium (Fig. 53). With linen sutures we anchor the ligament to the under surface of the rectus fascia, drawing it up to that point through an extraperitoneal passage. When this operation is completed there are no bands running across the peritoneal cavity the

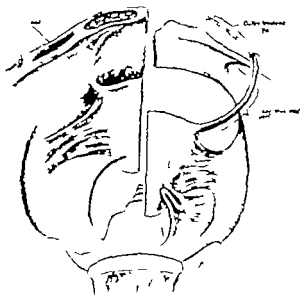


Fig. 53.—Semi-diagrammatic, showing the co-operation of the round and the uterosacral ligaments in maintaining the uterus in anteversion. The muscular part of the round ligament bears the strain.

uterus has not been touched with sutures, and there are no points of bleeding or exposed surfaces which predispose to post operative adhesions.

Now there are some cases in which you may prefer the Webster Baldy operation. That is based on a different principle and consists of drawing the round ligaments through the broad ligaments below the utero-ovarian ligaments, and attaching them

## OVARIAN CYST WITH SLOW TORSION NECROSIS, AND PERFORATION. OPPOSITE OVARY THE SITE OF A MULTILOCULAR CYST ELEVEN YEARS BEFORE

WOMAN aged fifty-seven. Chief complaints, swelling in left side, indigestion, nausea, headaches, occasional vomiting. Menstruation began at sixteen; periods recurred from twenty-seven to twenty-nine days; duration, four to five days; moderate flow, slight pain. Married at nineteen; six pregnancies, all normal; no abortions; normal, easy labors; no complications; no trouble in the puerperium; last labor occurred twenty-two years ago. Menopause at forty-six. Eleven years ago was operated on for ovarian cyst. Six weeks ago she was taken with a sudden hemorrhage; passed about a cupful of blood. There has been no bleeding since.

*Present Illness*—The lump started about the middle of November 1921 in the left side. She first noticed it herself. It has gradually grown larger. Pain in the left half of the abdomen is only occasional, but there is always tenderness on pressure.

### DISCUSSION WITH CLASS

Q. Bleeding that starts ten years after the menopause in the majority of cases has what significance?

A. Malignancy.

Q. Of what type and situation?

A. Carcinoma of the endometrium.

Q. What other conditions would come up for consideration?

A. Myoma uteri.

Q. Is it not unusual for a myoma to develop after the age of forty-six? What else sometimes occurs in older women.

A. Ovarian cyst.

Q. Is hemorrhage from the uterus usual in the case of ovarian cyst?

A. No.

indicated when the cervix is in descensus. You have all seen cases in which after the fundus is pulled up and forward by shortening the round ligaments the cervix still has a tendency to prolapse through the vagina that is where the additional operation on the uterosacrals is needed, and you will be very much pleased with its results.

## OVARIAN CYST WITH SLOW TORSION NECROSIS, AND PERFORATION. OPPOSITE OVARY THE SITE OF A MULTILOCULAR CYST ELEVEN YEARS BEFORE

WOMAN aged fifty-seven Chief complaints, swelling in left side indigestion, nausea headaches occasional vomiting Menstruation began at sixteen periods recurred from twenty-seven to twenty-nine days duration, four to five days moderate flow slight pain. Married at nineteen six pregnancies, all normal no abortions normal easy labors no complications no trouble in the puerperium last labor occurred twenty-two years ago Menopause at forty-six. Eleven years ago was operated on for ovarian cyst. Six weeks ago she was taken with a sudden hemorrhage passed about a cupful of blood. There has been no bleeding since.

*Present Illness*—The lump started about the middle of November 1921 in the left side. She first noticed it herself. It has gradually grown larger. Pain in the left half of the abdomen is only occasional, but there is always tenderness on pressure.

### DISCUSSION WITH CLASS

Q Bleeding that starts ten years after the menopause. In the majority of cases, has what significance?

A. Malignancy.

Q Of what type and situation?

A. Carcinoma of the endometrium.

Q What other conditions would come up for consideration?

A. Myoma uteri.

Q Is it not unusual for a myoma to develop after the age of forty-six? What else sometimes occurs in older women.

A. Ovarian cyst.

Q Is hemorrhage from the uterus usual in the case of ovarian cyst?

A. No.

indicated when the cervix is in descensus. You have all seen cases in which after the fundus is pulled up and forward by shortening the round ligaments the cervix still has a tendency to prolapse through the vagina that is where the additional operation on the uterosacrahs is needed, and you will be very much pleased with its results.

abdominal tumor and we may have a carcinoma of the endometrium or an apoplexia uteri to account for the hemorrhage.

Cervix Uteri Exposed with Bivalve Speculum.—Q Upon inspection of the cervix with a speculum, what do you see?

A. A small cherry red tumor with a stem—a polyp

Q Would this explain the hemorrhage occurring five weeks ago?

A. Yes

Q Do we stop there in our investigation as to the cause of the hemorrhage?

A. I think not. No certainly not, for this is an age in which we suspect carcinoma on the slightest provocation, and here we may have a cancer of the endometrium complicating an ovarian tumor we always consider the endometrium guilty until proved otherwise so we curet the uterus thoroughly (Curetment.)

Q Tell me, are we dealing here with a carcinoma of the endometrium?

A. No. If it were carcinoma there would be a larger amount of curetings.

Q With what might you compare the curetings in a case of cancer of the endometrium?

A. Fragments of dry cheese or cauliflower

Q Exactly Here we are practically sure there is no carcinoma, because the amount of scrapings is so small and there is no friability or whitish color but the mucosa comes away in long pink strips. But we will send the curetings, nevertheless to the laboratory for examination. If this patient had a carcinoma of the endometrium, then with whatever else we did, a panhysterectomy would be indicated. Otherwise there might be malignant tissue left in the cervix. As the case now stands, if it is necessary to remove the fundus of the uterus with the abdominal tumor a supravaginal hysterectomy will suffice. Let me say a word here relative to diagnostic curetage. You must have a pathologist who has had special training and experience in the diagnosis of uterine scrapings. Otherwise mistakes will occur

Q What else might explain the sudden hemorrhage? What is the cause sometimes in older women of sudden hemorrhage from the uterus?

A. High blood-pressure and arteriosclerosis.

Q Yes. As in the brain, so in the uterus—apoplexy. Due to high blood-pressure a small vessel may burst in the endometrium and produce a flow of blood. But as the patient tells you that she noticed a lump in her abdomen a month before she had the hemorrhage, you naturally wonder whether the two have not the relation of cause and effect. An abdominal enlargement at the age of fifty-seven big enough to rise above the brim of the pelvis and attract the notice of the patient herself is more likely to be an ovarian cyst than a carcinoma of the fundus of the uterus. Will you tell me why?

A. Carcinoma is a relatively rare condition and it is not so big.

Q It is not a relatively rare condition, unfortunately not at all, but you are correct in saying that it does not produce an abdominal tumor or at least not until the disease is far advanced and the patient is *in extremis*. In other words, until the cancer grows through the uterine wall and involves the peritoneum. The most common pelvic tumor at this time of life causing abdominal enlargement is a tumor of the ovary—an ovarian cyst. But we do not, as a rule have hemorrhage as a symptom of ovarian cyst. Take the average ovarian cyst—the multilocular cystadenoma—what are the symptoms or rather what is often the first symptom the woman complains of?

A. Sometimes the first thing she notices is that the abdomen is getting larger.

Q Yes. No pain or distress, but she must let out her skirt bands. Why does a cyst of that kind give no symptoms?

A. Because it is a smooth movable tumor which rises out of the pelvis and floats so to speak among the intestines in the abdominal cavity. Up to the present time therefore in our study of this case we do not quite understand the bleeding. We, of course, realize that we may have here an association of diseases that is, we may have an ovarian cyst producing the

NOTES FROM ANESTHESIA CHART

*Diagnosis*—Multilocular cyst of left ovary chronic torsion, necrosis and perforation of the capsule, and discharge of contents into the peritoneal cavity possibly carcinomatous degeneration (pathologic examination exhibited no malignancy)

*Complication of Operation*.—Very free oozing from the separated peritoneal surfaces giving rise to fear of carcinomatous involvement of the peritoneum (not confirmed by subsequent histologic examination) The operation was diagnostic D and C, excision of cervical polyp supravaginal hysterectomy and left salpingo-oophorectomy the right adnexa were missing



On bimanual examination of the patient we find the uterus normal in size, slightly displaced to the right a mass as large as a child's head rises up above the pelvic brim and lies in the left iliac fossa. It is distinctly separate from the fundus of the uterus, it has slightly restricted mobility it is resilient to the touch, not distinctly fluctuating dull over the most prominent part, with a ring of coronal resonance around it. The general examination of the patient shows a blood-pressure of 130/80 the blood and urine are normal the phthalein output is satisfactory and a Wassermann is negative. The medical staff reported emphysema and chronic bronchitis but not in a degree that forbade anesthesia. These facts in the history and the examination being known to you let us briefly examine them and make a diagnosis. We must agree that a cystic tumor of the ovary seems probable. It is not at all uncommon for a patient who has had cyst adenoma of one ovary to get the same thing on the other side later on. They are not infrequently bilateral. This tumor is not entirely free. That may be due to adhesions the result of the first operation. It may be some complication or accident which has befallen the cyst. This appears more likely and especially so when we remember that ovarian cysts of this position and size often produce no symptoms except abdominal enlargement. We here suspect some complication and in a woman of this age carcinomatous degeneration appears most likely.

**Abdominal Operation Begun.**—On opening the peritoneum we find some free fluid not bloody but yellowish serum with flakes of yellowish-gray sloughs.

Q What sort of fluid would make you think it once that you were dealing with carcinoma?

A. Bloody fluid.

Q Correct. Did we not find that many of these tumors give rise to no symptoms save distention of the abdomen unless they are complicated? What are some of the complications?

A. Complications are torsion, rupture inflammation and carcinomatous degeneration.

## LARGE CYSTOCELE AND UTERINE PROLAPSE IN A DIABETIC

THIS patient is a woman fifty-nine years old, who has a prolapse of the uterus and a large cystocele. She was first admitted to the gynecologic ward in April, 1921 and at that time sugar was found in the urine. A diet was prescribed and she was sent home. She was readmitted to the medical floor December 29, 1921 and placed on a carbohydrate-free diet until the sugar was eliminated from the urine entirely and then the carbohydrates were gradually increased until the point of tolerance was reached.

Diabetes has often been held as a positive contraindication to any sort of operation. One dread of the surgeon has been that the wounds in the diabetic patient would not heal another was that many diabetic patients after operation died in coma, and in the past this condition baffled the internist as well as the surgeon. Some years ago in 1902, Charles P. Noble wrote a paper upon this subject, describing how he had operated upon a diabetic, being unaware at the time of the presence of sugar in the urine. This case resulted successfully and he reported 7 additional ones, all of which had done well, the wounds had healed by first intention and there had been only one death from diabetic coma. He had collected 62 other cases from the literature of all kinds, of which the mortality had been about 24 per cent. At that time there were no well-recognized premonitory clinical laboratory indications of diabetic coma. The surgeon felt quite hopeless in recognizing the cases in which this fatal complication was likely to occur as well as being at a loss for curative measures. The patient was put on treatment, mainly the opium treatment, until the urine was as near sugar free as possible, and then the risk of operation was hopefully undertaken. Fortunately in recent years the presence of acetone and diacetic acid in the urine and the other symptoms of acidosis are recognized as precursors of diabetic coma and operation is avoided when these conditions



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cannot be corrected. By suitable measures the acetonaemia or acidosis may be set aside in favorable cases and the postoperative measures for the prevention of this dreaded complication are well understood. The old dread that wounds in diabetic subjects would not heal was based upon a misinterpretation, and, as Noble pointed out, it occurred chiefly in the amputation stumps of patients who already had diabetic gangrene of the extremities. So that the modern attitude of the surgeon toward the diabetic is considerably altered from that of years ago and at the present time although diabetes is still held to be a contraindication to operations purely elective in urgent cases, if the patient can be rendered sugar free or if in spite of a little sugar which persists in the urine there are no evidences of acidosis, an operation may safely be undertaken, the usual precautions being observed before and after to prevent the occurrence of acidosis.

With no sugar acetone or diacetic acid in the urine we had no hesitation in advising operation. The patient had used a pessary with unsatisfactory results, and operation was needed badly to enable her to earn her living. A soda was given previous to the operation, but enteroclysis of 2 per cent. soda solution will be started immediately after the operation, the urine will be examined daily and the diet carefully regulated.

A Watkins Interposition operation and perineorrhaphy were performed. The urine contained sugar the day after operation, also acetone but with soda and restricted diet this disappeared the convalescence was uninterrupted.

## URETERAL STRICTURE WITH HYDRO-URETER, NEPHROPTOSIS, AND HYDRONEPHROSIS. DILATATION OF STRICTURE AND NEPHROPEXY

THIS patient is fifty years old. She was admitted to the medical service more than a month ago complaining of severe pain in the right loin and frequent and painful urination. On examination the right kidney was enlarged and tender the urine contained pus and blood. Cystoscopic examination showed a trigonitis with much swelling of the mucosa at the right ureteral orifice. Attempts to pass a catheter into the right ureter were unsuccessful. With rest, applications of heat, etc. the swelling of the kidney subsided and ten days later we were able to pass a No. 5 ureteral catheter to the kidney pelvis. The urine from the bladder and the right kidney contained pus-cells there were no pus-cells in the urine from the left kidney all the cultures were sterile. A pyelograph of the right kidney pelvis and ureter (Fig. 34) showed hydronephrosis and hydro-ureter. The ureteral stricture which was located in the vesical portion of the ureter was dilated at weekly sittings up to 8 F. This was done by my assistant, Dr. Gmsberg, who uses the direct method of ureteral catheterization. The patient experienced considerable relief from the treatment, but as soon as she got out of bed her discomfort returned. She is of a neurotic habit, but her suffering seems real, and as the pyelograph exhibits not only ptosis of the kidney and dilatation of the renal pelvis but also torsion of the kidney nephropexy is deemed necessary to secure entire relief from the troublesome symptoms. Her kidneys are deficient in function the total phthalein output is 25 and the excretion of indigo-carmin is delayed and deficient on both sides but especially on the right. (Nephropexy was then done, following the Edebohl's capsule splitting and reflection technic.) As a result of this operation the kidney will be securely attached to the quadratus lumborum the range of mobility will be limited, ptosis and

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## CLINIC OF DR. GEORGE P. MULLER

### UNIVERSITY HOSPITAL

#### EMBRYONAL ADENOMYOSARCOMA OF KIDNEY

*Synopsis* Female Baby Age Fifteen Months. Painful Tumor the Only Symptom. Complete Nephrectomy Pathologic Diagnosis Showed the Tumor to Be of Teratomatous Nature. Recurrence in Two Months, Rapidly Increasing, with Evidence of Involvement of the Right Lung Throughout Its Area.

THE child which I am about to show you was operated on last September. The history is as follows:

E. B., age fifteen months; was referred to me by Dr. Jaffe last September Two and half months previously the mother had noticed some distention of the abdomen and, later while bathing the baby she accidentally felt the mass in the left upper quadrant. It has steadily increased in size (Fig. 55). The



Fig. 55.—Relative position and size of the growth before operation.

child became increasingly fretful and her color much paler than several months previously. The physical examination was negative except for mass about the size of grapefruit in the left hypochondriac, epigastric, and left lumbar regions. There was moderate anemia, the red cell count being 3,250,000. There was no hematuria.



torcion will no longer occur and with complete dilatation of the stricture below we may reasonably expect the patient to be cured. Furthermore the new circulation which will become



Fig. 34.—Right hydronephrosis and hydroureter—stricture of lower ureter, ptosis, and torsion of kidney. (The negative has been reversed in printing.)

established between the quadratus lumborum and the decapsulated surface of the kidney may decidedly improve the renal function.

At the operation performed on September 6th I made a left rectus incision, the scar of which you see. It was necessary to mobilize the splenic flexure of the colon by dividing the peritoneum on the outer side of the splenic flexure and the descending colon. It was not until the colon was mobilized that I was positive that the mass was the left kidney. The mass, which was even larger than we expected was about 6 inches long 5 inches thick, and about the same in breadth (Fig. 56). It was removed in the way a nephrectomy is performed. The peritoneum was closed with a continuous catgut suture and the abdominal wall with interrupted silk-worm-gut sutures. Although the bleeding was not excessive the child was greatly shocked and so I transfused her with 150 c.c. of citrated blood, introducing it into the left saphenous vein. The recovery was uneventful and she was taken home eleven days later. At the lower end of the wound there was a superficial infection.

The pathologic report of the specimen made by Dr. Case is as follows: "The tumor is very interesting and peculiar. It is a cystic affair with soft solid areas, evidently largely necrotic, and firmer portions that cut easily. Microscopically it consists of several types of tissue. The groundwork is loose fibrous tissue that is quite cellular and in this there are numerous pink fibers some of which are imperfectly striated muscular tissue. The epithelial elements vary from small gland-like structures lined with columnar tissue to large cysts where the epithelium is flattened. Diagnosis: Teratoma of the kidney probably malignant (Fig. 57).

In November 1921 I saw the child again, and I felt a small mass in the region of the original growth which I thought was a recurrence. This has subsequently proved to be the case since at present (January 1922) the mass is larger and the x-ray of the chest shows extensive metastasis to the right lung.

Discussion.—These teratomas are peculiar in their make-up and confusing in their etiology. They are complex structures composed of tissues and organs of one or more germinal layers. There is little or no orderly arrangement of the various tissues. The classification is by no means clear and there is frequently

It was suspected that we were dealing with a growth from the left kidney although the mass came so close to the median line that the possibility of a retroperitoneal sarcoma was considered. Painful hematuria with tumor is the characteristic symptom of a kidney tumor in the adult usually a hyperneph-

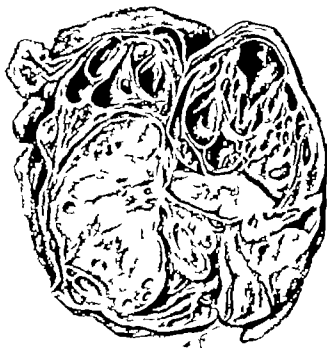


Fig. 36.—Gross specimen of kidney and tumor removed at operation. Note the partly solid and partly cystic character. Drawing is about one-third normal size.

roma or a carcinoma. Painful tumor without hematuria is the characteristic feature of these mixed tumors seen in children. It seemed unnecessary to inflate the colon, to practice a 'pneumoperitoneum' x-ray or cystoscopy. Accordingly I did an exploratory operation.

have only seen two other cases of this affection and have been unfortunate in both of them. In 1920 an eighteen months old boy was admitted to the University Hospital suffering from one of these tumors in the right kidney and died from shock after the nephrectomy. The third case was seen in the Poly clinic Hospital and operated on October 28 1914. The child was seven years old and had had symptoms for a year previous. In May 1915 he returned with a recurrence and I suppose has succumbed although we lost track of him.

a difference of opinion between pathologists as to their exact grouping. If you turn to Ewing's book on *Neoplastic Diseases* you will find that the interpretation of the origin of renal mixed tumors has passed through several phases and covered all apparent possibilities. He considers the theory of Busse and Muus as the most acceptable, in which the renal blastema is considered to be the point of origin for all the structures observed in the tumor. It attributes a prominent part to metaplasia.

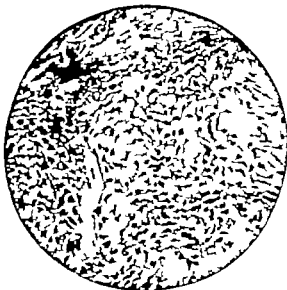


Fig. 57 —Photomicrograph shows big spindle-cells and muscle-fibers.

The tumor is usually found at birth or shortly thereafter although a case of a bilateral tumor in a patient fifty four years old was reported by Hedron. They are the largest of renal tumors, Heineke's tumor weighing 3580 grams. Our case is similar to Brandt in that pulmonary metastasis occurred several months after extirpation of the tumor. This is exceptional, since metastasis is not frequent, and usually in the liver. This child will probably live only a very short time. I

## HEMOLYTIC ICTERO-ANEMIA

*Synopsis* Woman, Age Thirty-six Years. Duration Very Indefinite. Patient Came Under Observation Because of Severe Pain and Jaundice. The Anemia and the Splenomegaly were Revealed During the Physical Examination. Frequent Blood Transfusion Was Followed by Splenectomy Cholecystectomy and Removal of Ovarian Cyst. Postoperative Transfusion Performed. Perfect Recovery

THE next case is interesting as illustrating a type of anemia associated with splenomegaly which is cured by surgery. The history of the case is as follows:

E. M., age thirty-six, nurse, was transferred to our service August 20, 1921. The diagnosis was hemolytic ictero-anemia with cholelithiasis. Her history is short, was as follows. She had had measles and whooping-cough during childhood. She never had pneumonia, typhoid, or influenza. Since very young child she has had attacks of dizziness and weakness. Her complexion has always been somewhat yellow and three times during her life she has had attacks of jaundice lasting two or three days, preceded by and accompanied by pain. About six days ago she developed intense pain over her gall-bladder which has increased in intensity. She feels distended. The pains shoot across the abdomen toward the left side and up the back. She has become increasingly jaundiced with this attack. Nausea and vomiting have been pronounced. There is no itching of the skin. During this last attack the stools have been clay colored. On examination we found that the skin was not deeply jaundiced, but seemed to be color between the lemon-yellow color of the hemolytic anemia and that of jaundice proper. There was a large tumor mass in the left hypochondriac region which we diagnosed as the spleen. The red blood count on admission to our service was 2,170,000. Dr. Rawlin transfused the patient four times, and the count just previous to operation, 8/27/21, was 3,920,000 red blood-cells. At the operation on August 27th I made right-angled left rectus incision (Fig. 58) and exposed the spleen, which as large as you can see from the picture (Fig. 59) and irregular. Troublesome bleeding was encountered in the stump of the gastro-splenic ligament and in the tail of the pancreas. The spleen weighed about 1000 grams. It was deeply purple in color. I found the gall-bladder distended and full of stones, and so I did cholecystectomy. While I was waiting for the sponge count I found a large ovarian cyst on the left side and also removed this. Dr. Rawlin then transfused the patient with 500 cc. of blood and 750 cc. of saline. The patient's condition is satisfactory. The red blood-cell count 8/29 is 2,410,000.



that it is a little safer to use whole blood than to use the citrate. With the new citrate which we are using now chills do not occur frequently but still they do depress a severely ill patient.

The operation was done in the period between crises for the acute exacerbations (crises of deglobulization) typical to this



Fig. 59—Gross specimen of spleen removed at operation.

disease offer definite contraindications to immediate operation. During these crises there is tenderness over the spleen, malaise, increased anemia and jaundice and operation at this period may be fatal.

The coincidence of hemolytic ictero-anemia and gall-stones is very frequent and removal of the gall-bladder is usually neces-



The pathologic report (8/27/21) is as follows: The organ is much enlarged and firm. Microscopically there is marked reduction in the size and number of the malpighian bodies. There is paucity of cells in the pulp and the sinuses are widely distended with blood (Fig. 60). Considerable blood pigment is to be found scattered through the organ. There is little or no increase in the fibrous framework of the organ. From its gross and microscopic appearance I would diagnose it as spleen of splenic anemia. Diagnosis Splenomegaly.



Fig. 58.—Incision marked on the scar three months after splenectomy

At discharge (9/18) the red blood cell count was 3,950,000. There was no wound infection and the patient left the hospital in excellent condition. I saw her again on January 6, 1922. The R. B. C. is 4,780,000 and the hemoglobin is 82 per cent. She is now back doing general duty nursing.

Discussion.—There are several interesting features about this case. In the first place, Dr. Ravdin and I were in no hurry to remove the large spleen, but instead gave her repeated transfusions by the citrate method. In those cases of primary anemia where the patient is extremely ill from profound anemia I feel

This disease was first described by Hayem in 1898 and is generally referred to as the acquired type (Hayem-Widal) of hemolytic icterus with splenomegaly. A somewhat similar type is seen in children and is termed the congenital or familial type of Chauffard-Minkowski. Splenectomy properly done, will cure the majority of the cases. The mortality of operation is not more than 5 per cent. in good hands.

sary. Several years ago Giffin in reporting the cases from the Mayo Clinic, found that in 7 (58 per cent.) gall-stones were present. About 60 per cent. of all reported cases, according to Moynihan, have had stones, and our case shows the typical picture of a gall-bladder full of small stones and gravel. This fact is often confusing in the diagnosis for the passing of stones may give frequent attacks of transitory jaundice but the anemia



Fig. 60—Photomicrograph of section of spleen. A, Splenic sinus; B, splenic pulp. The granules are from broken-down red cells.

and large spleen and the mild acholuric jaundice between the point to the primary condition. Unless tones re present is colored stools choluria and itching of the skin are not present. It is important to elicit decreased resistance of the red blood cells to hypotonic salt solution. This fragility of the reds usually accompanied by great increase in the urobilin output and in the percentage of the reticulated red cells.

## CHONDRO-OSTEOSARCOMA OF FINGER

*Synopsis* Woman Aged Eighty-six Years. History of Trauma. Seven Years' Duration. Growth Rapid in Past Two Years, Until Size of an Adult Foot. Ray Showed an Osteosarcoma of Proximal Phalanx of Left Index-finger. Excision Under Local Anesthesia. Recovery.

THE next patient presents a rather rare condition about which you will find the most information from the papers by Bloodgood, particularly that in the *Journal of Orthopedic Surgery* for November 1920. The history of this case is as follows:

B. F. aged eighty-six years. Referred from the Out-patient Department. The family history is negative for malignancy. She has suffered from rheumatism for fifteen years. Some accidental trauma in early life resulted in deformity (crooking) of the left index-finger. About seven years ago the second phalangeal joint began to enlarge very slowly until two years ago, when it was about the size of a large walnut. At this time it began to increase very rapidly in size, until now it is as large as the average fist and is spindle shaped (Fig. 61). The terminal phalanx is least involved. About one month ago the surface on the lateral surface of the finger broke down and a foul-smelling ulcer resulted. For the last three or four years the patient has been developing progressively senile dementia. Appetite is excellent. Not constipated. Has lost about 30 pounds in weight in the last year.

Physical examination revealed nothing of importance except the evidence of great senility. The systolic blood-pressure is 188, the diastolic 76. The urine was free from albumin or casts and there is no anemia. As seen by the photograph, the growth involved all three phalanges of the finger and extended into the palm. The x-ray report is as follows: "Osteosarcoma of proximal phalanx of left index-finger with involvement and partial destruction of base of the middle phalanx and probably beginning disease of the second metacarpal bone (Fig. 62). x-Ray examination of the chest not entirely satisfactory because patient could not hold her breath. There is no evidence of pulmonary disease or any definite evidence to suggest pulmonary metastasis. The heart is somewhat enlarged. Shadow of aorta is increased in width and density. Probably atherosclerosis.

The growth was removed under local anesthesia on December 1, 1921 by partial amputation of the hand. Pathologic report by Dr. Case: "Sarcoma showing both bone and cartilage formation. There is also some necrotic degeneration (Fig. 63).



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**Discussion.**—Originally I had advised a high amputation, but the family objected so we contented ourselves with a removal of the growth together with the middle finger and the second metacarpal. Local anesthesia was used, the solution being 0.5 per cent. novocain. The field had been prepared with a 5 per cent. solution of picric acid in alcohol. An Esmarch

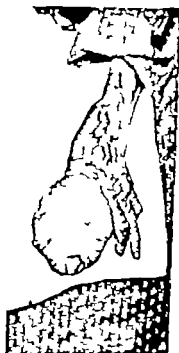


Fig. 61—Gross appearance of tumor before operation

bandage was at first applied, but was removed because of oozing from the ulcerated area. In order to understand how perfect the anesthesia can be when combined nerve blocking and infiltration is used we must first discuss the anatomy of the region (Fig. 64). The sensory supply on the dorsal aspect of the wrist is from the lateral to the median side the lateral cuta-



Fig. 62.— Ray appearance of tumor before operation



Fig. 63.—Photomicrograph of tumor. A Myxosarcoma B bone C, cartilage



neous nerve of the forearm, the *ramus superficialis* of the radial, the medial cutaneous nerve of the forearm, and the terminal sensory twigs of the ulnar. Anteriorly in the same direction we have the same nerves except that over the middle of the wrist we have sensory innervation from branches of the median. It was only necessary to infiltrate the lateral half of the wrist

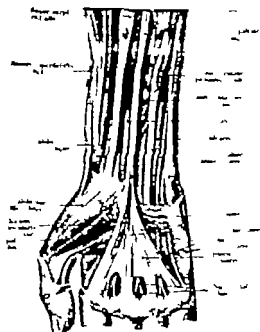


Fig. 64.—Anatomic relations of the anterior surface of the forearm (Spalteholz)

anteriorly while posteriorly the entire area was infiltrated because, as the figure shows, the ulnar has a sensory distribution in the region of the amputation (Fig. 65)

So I made a small horizontal incision anteriorly at the wrist and exposed the median and radial nerves and injected them. The exposure is simple (Fig. 66). The *ramus superficialis*

radialis is lateral to the tendon of the supinator longus (brachioradialis m.) and is found just above the wrist crossing the tendon of the abductor pollicis longus. The radial artery is medial to the tendon of the supinator longus while next to it is the tendon of the m. flexor carpi radialis. Between this tendon and the

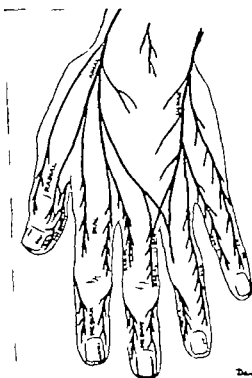


Fig. 65 — Nerve distribution to the back of the hand (G. G. Davis).

tendon of the palmaris longus and slightly deeper than them is the median nerve. The skin incision was made as shown in the diagram, and it was necessary to infiltrate only a little on the back of the hand. The index- and middle fingers were removed and all of the second metacarpal and half of the third metacarpal bones also. Hemorrhage was stopped and the skin

closed without drainage. Patient made an uninterrupted recovery and is ready to be discharged with the result you see here (Fig. 67)

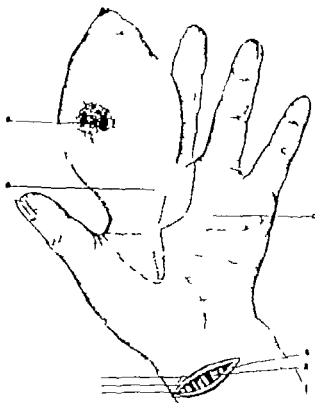


Fig. 66—Exposure at the first showing also the line of incision and excision in the palm. *A*, Necrotic area. *B*, line of incision. *C*, line of excision. *D*, flexor carpi radialis. *E*, radial artery. *F*, radial nerve. *G*, palmaris longus. *H*, median nerve.

We believe that this tumor originated as a chondroma with subsequent malignant transformation. Chondromata are common tumors, and last year I reported in this publication several

of the benign varieties. They are usually located in the diaphysis of the long bones especially adjoining the epiphyses. A very frequent site is the metacarpal bones and phalanges of the hand. In the humerus and femur they most frequently originate from the periosteum while in the bones of the hand their origin is usually from the medullary canal. Although when seen in the hand chondromata are usually multiple this one which has become malignant, is single. They may become malignant as distinct chondrosarcomas, or they may become



Fig. 6 —Condition of the hand about one month after operation.

mixed as in this case. You can see from the x ray that the tumor projected externally pushing the periosteum and a small shell of bone ahead of it finally rupturing through thus leading us to believe that it probably began as an enchondroma.

Weber thinks that trauma is a predisposing factor in 50 per cent of the chondromas and chondrosarcomas. Other possible etiologic influences are metaplastic changes of other forms of mesodermic tissue embryonic rests of cartilage inflammation heredity a several cases may occur in one family and Mac

Callum believes that they may arise from periosteal or endosteal cells.

Very frequently when the tumor has originated as a chondroma the cells in the center of the tumor are apparently normal cartilage cells, while those at the periphery are true sarcoma cells. When this is true we find a tumor such as this one, which is very vascular at the periphery and practically avascular in the center. The metastasis from such tumors may be true sarcomas and show no cartilaginous deposit.

## THROMBO-ANGELITIS OBLITERANS (BUERGER)

*Synopsis:* Polish Male, Age Forty-nine Years. Two Years Duration Typical Case Involving Toes and Lower Part of Foot. Amputation of Foot and Lower Third of Leg. Amputation Followed by Pain (Causalgia) which was Controlled by Femoral Sympathectomy and Section of Crural Nerve.

THE next patient represents a fairly common condition especially in our larger cities. It is important because the average physician has not learned the true pathology of the disease and classes it with the diabetes or senile gangrenes. The history of the patient is as follows:

G. M., aged forty-nine. Polish Jew. The patient's previous medical history and environment as unobtainable owing to his imperfect understanding of English. T years ago he began to have pain, redness, and swelling in his right small toe which kept increasing in severity and finally spread to other toes and infected them. In the meanwhile, however, the small toe was amputated, but the redness and swelling spread over to all of the toes and to the middle of the foot. The pain has increased, especially when he has his leg in dependent position. The sensation is that of cold and sticking pain.

Physical examination reveals little of importance. H. has many carious teeth and some stumps. The tongue is coated and the breath foul. There are no abnormal findings in the lungs, and except for some muffling of the heart sounds nothing else abnormal was detected in the chest. There was no involvement of the upper extremities. There was no involvement of the left foot and leg. On the right lower extremity was seen dusky redness extending from the tips of the toes to the middle of the foot, and then gradually shading off as the leg was reached. In spots the epidermis was necrotic and black. The toe-nails were greenish in color. The entire foot was painful and tender. When the leg is elevated for few minutes everything becomes blanched. The urine was negative for sugar and the blood-sugar was 1.85.

He was treated for few days with large quantities of Ringer solution introduced through the duodenal tube, and little later by injections of sodium citrate. H. was given potassium iodid in large doses. H. suffered continually from pain and, accordingly, the leg was amputated on November 29, 1921. Following the operation the patient complained bitterly of pain referred to the toes. It was typical stump pain. The wound had healed without infection and there was no reason apparent for the pain. On December 17, 1921, the Leriche operation of femoral sympathectomy was performed. The crural branch of the genitocrural nerve was cut. The patient

is ready for discharge, entirely free from pain, and prepared to use an artificial leg. The pathologic report of the tissues of the right extremity is as follows: "Sections were removed from the anterior tibial artery posterior tibial behind the internal malleolus, portions of deep planter and sections from the anterior and posterior superficial vessels.

"They show beautiful thrombo-arteritis obliterans with canalization of the organized thrombus by totally insufficient blood-channels. Some of the sections show perivascular fibrosis grasping the accompanying nerves (Fig. 68).



Fig. 68.—Photomicrograph of posterior tibial artery. A. Internal elastic membrane. B. canal.

*Discussion.*—I think that this is one of the most interesting conditions we are called upon to treat. As some of you no doubt may know a disease called erythromelalgia was described by Weir Mitchell in 1872 as painful red state of the limb. Naturally in this his home city we recognize from time to time cases of this type in which the patient complains of burning pain increased by warmth and with characteristic reddening of the foot when the limb is pendent and never terminating in gangrene. Some have believed that it is only a manifestation of neuralgia or neuritis, of neurasthenia or hysteria or is a reflex disease but Weir Mitchell himself believed it to be neuritis of nerve endings.

Many cases of the disease from which this patient is suffering were no doubt classed as erythromelalgia until Buerger in 1908 cleared up the subject by extracting the large group seen especially in Polish or Russian Jews, and which he termed 'thrombo-angitis obliterans'. In the group with Weir Mitchell's disease we generally place Raynaud's disease, scleroderma, sclerodactyl, and acrocyanosis. In these diseases there is no alteration in the patency of the arteries and veins. Another group comprises the true gangrenes, those due to senile arteriosclerosis, diabetes, syphilis etc. It is hardly necessary to go over the various theories of *Buerger's disease* which may be said to constitute a third group. Buerger himself believes that the disease has its inception in an acute inflammatory lesion in the blood vessels, resulting in the formation of red obliterating thrombi and occlusion of both the arteries and the veins. Buerger who has observed and studied many cases of this disease among Russian and Polish Jews in New York has presented strong evidence which tends to point to a toxic or an infectious origin. Associated with the intravascular changes we find a periarteritis which often involves the sensory nerves. There has been some interesting work done recently which shows the relative frequency of thrombo-angitis obliterans in typhus-infected areas.

We could not do better than to quote the following from one of Buerger's articles in order that you may fully understand the nature of this gangrene. (1) The disappearance of the pulses, particularly the dorsalis pedis, posterior tibial and popliteal, more rarely the femoral, radial, and ulnar. (2) the development of typical manifestations of impaired circulation to wit: blanching of the lower extremities when these are elevated above the horizontal; hyperemia (rubor) or reddening of the foot in the pendant position (a chronic condition which I have elsewhere termed 'erythromelia') during certain stages of the disease and trophic disturbances, such as impaired growth of the toenails, slightly atrophic condition of the skin, ulcers and gangrene. (3) true vasomotor phenomena of transitory nature such as alternating syncope, rubor, coldness, apparently independent of those chronic changes that have been cited above and that



are distinctly traceable to the occluded condition of the arteries and veins (4) the symptoms of pain, either in the form of intermittent claudication (pain in the calf of the leg or in the foot on walking with cessation when the limb is at rest) or the severe pain that is associated with the advent of trophic disturbances, especially with ulcers and patches of gangrene (5) the slow course of the disease symptoms of intermittent claudication or pain, preceding the development of trophic disturbances for months and years (6) the fact that more than 99 per cent. of the cases occur in Polish, Galician, or Russian Hebrews, and that almost always young males between the ages of twenty and thirty are taken with this disease (7) the onset of symptoms in the lower extremities, one of the legs being first affected (8) the comparative infrequency of involvement of the upper extremities (9) the association of a peculiar type of migrating phlebitis in the territory of the external or internal saphenous, less frequently in the larger veins of the upper extremities, characteristic in about 20 per cent. of the cases (10) the slow but steadily progressive course, leading in a large majority of the cases to amputation of at least one limb not infrequently of both lower extremities, and in rare instances to amputation of one of the upper extremities as well." The real problem, however in this disease is that of treatment. The patients want relief from the intolerable pain. They cannot get around to do their daily work and they are constantly threatened with gangrene. Much can be done symptomatically but unfortunately only palliation is obtained. *It is a very difficult thing to make the patient consider amputation early* and they do not until the increasing pain despite treatment has driven them into accepting any measure of relief. I believe that with our present methods of treatment we have nothing whatever to offer the patient except amputation which assures any reasonable promise of success. I would suggest to you, however that it is best to palliate at first and to advise division, or alcoholic injections of the internal saphenous or musculocutaneous nerves, followed by the use of passive hyperemia with a Bier suction cup by means of the postural treatment (alternately raising and lowering the leg with an interval

of several minutes between movements) The electric-light cradle also gives relief if palpitation is desired.

Other more conservative methods than amputation which have been suggested are (1) Ligation of the femoral vein (2) the use of nitrites, iodids, and various glandular substances (3) the use of liquids such as saline or sodium citrate either subcutaneously intravenously or duodenally in order to alter the viscosity of the blood (4) local measures, such as those already suggested, which tend to improve or modify the circulation.

I do not think that we can look for anything in the form of cures from arteriovenous anastomosis. I cannot see how a reversal of the circulation would offer anything in vessels that are already thrombosed and how if the etiology is infectious or toxic, a reversal of the circulation could allay the process.

The suggestion made a few years ago by Dr. Willy Meyer of New York, that we give these cases large amounts of fluid was followed out in our case. Meyer thought that these cases showed a hyperglycemia and compared them to a flower withering for the want of water. His treatment, therefore, consisted in supplying an abundance of water to the system. He aimed to produce the highest possible degree of hydremia, introducing the fluid both through the duodenum and by hypodermoclysis. He used 8 to 10 quarts of Ringer's solution or a solution of sodium bicarbonate (from 15 to 30 grams of the salt per day) of body temperature were given by the rapid drop method within twenty four hours. Koga reported the return of an almost normal pulse in 10 out of 13 Japanese treated with hypodermoclysis. However recent studies of large groups of cases do not show that these patients always have a high blood-sugar content.

The Schnee four-cell electric bath has been used and there have been reports of relief from this treatment. Steele has used large doses of sodium citrate in an attempt to alter the viscosity of the blood. A measure of the apparent success of all of these methods must be attributed to the fact that the patient is kept recumbent while the treatment is being carried out, and it is folly to assure the patient of a permanent cure with any of them.



## CLINIC OF DR. JOHN H. JOPSON

### PRESBYTERIAN HOSPITAL

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#### FUSIFORM ANEURYSM OF THE FEMORAL ARTERY MATAS' OPERATION

This patient is a negro laborer thirty five years of age who has noted a swelling in the right thigh for six months. At first it was very small, he had a "feeling of chills" in his leg which attracted his attention to it, but it gave him so little pain and discomfort that he treated it by home remedies of the usual weird varieties favored by this class. It remained small and, according to his account, difficult of detection until four weeks ago when it began to increase rapidly in size and the region became extremely tender. At the same time he noted a numbness in the leg below the knee and the flexor muscles of the knee became contracted. These symptoms brought him to the hospital.

The man was formerly a sailor, used alcohol to excess, has a venereal history (gonorrhea in 1909, same type of venereal sore in 1910), smokes a good deal, and now does hard manual labor. He uses a shovel and presses against it with his thigh about where the swelling appears.

His physical condition in general is good. The physical examination shows nothing of moment except the condition for which he seeks treatment. He has a 4+ Wassermann. There is a large pulsating swelling in the line of the femoral artery about the middle of the thigh (Fig. 69<sup>a</sup>). It measures 4½ by 6½ inches in diameter and the pulsation is expansile. There is a systolic thrill and on auscultation a loud bruit is heard transmitted downward. There seems to be some in-

The illustrations are reproductions of drawings made by Mr. Fisher at the time of operation.

inflammatory reaction around it, and there is also tenderness around the knee joint. There is no swelling of the leg below. The diagnosis, of course, is plain and easy.

The circulation is controlled by the application of a tourniquet as far away as possible. A long incision through the

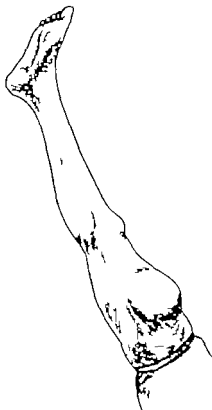


Fig. 69.—Fistuliform aneurysm of the femoral artery

overlying tissues exposes and then opens the sac, which is filled with soft clot. This is wiped away and the interior is dry except for a slight recurrent oozing from the lower (distal) arterial opening. The outer wall represents the site of the

arterial wall and is white and glistening in appearance, the afferent and efferent openings of the vessel in plain view and the wall between quite flat, except for a single shallow depres-

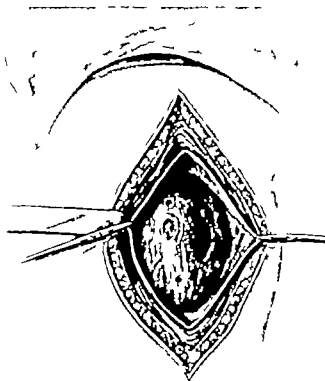


Fig. 70.—Appearance of the interior of the sac after incision and removal of the clot. The round upper and lower openings represent the afferent and efferent openings of the artery.

sion (Fig. 70). The major portion of the sac is to the inner side and much deeper. It represents the direction in which the aneurysm is dissecting rapidly extending downward between

the adductors, and its surface is covered with a thin, glistening, lead-colored membrane. There is little of the thick organized clot in most of the sac, and from the history of the case showing the rapid increase in size of the aneurysm, this is not surprising.

The sac is wiped clean with moist sponges, and the afferent and efferent openings of the artery are sutured with interrupted

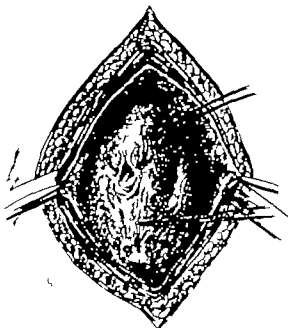


Fig. 71.—Suture of vessel openings from skin the sac

stitches of No. 0 chromicized catgut, three at the upper and four to the lower opening. The flat depressed area between probably the site of a branch, is then separately sutured (Fig. 71). No additional collaterals bleed on removal of the tourniquet. The sac is now obliterated by successive rows of sutures of chromic gut (Figs. 72-73) and the skin wound closed.

without drainage, after suture of the overlying muscles and fascia (Fig. 74). A posterior splint is included in the dressing.

[*Note*—The above case was discharged from the hospital twenty days after operation, cured of his aneurysm, having made a smooth recovery and was transferred to the Urological Service for further treatment of his luetic infection.]

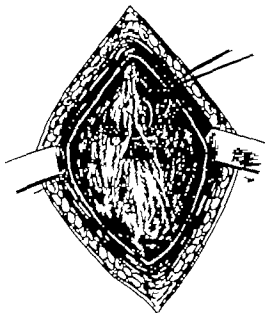


Fig. 72—First obliterating suture being pulled

This case is one well adapted to the obliterative type of the Matas operation. This is, of course the operation most often found feasible in operations for aneurysm and the one therefore most frequently performed. The most recent statistics on the operation of endoaneurysmorrhaphy (the spelling is that adopted by Matas) which I have seen are to be found in Matas' article published in *Surgery Gynecology and Obstetrics*, May 1920 and Keen's *Surgery*, Vol. VII, 1921. They include a total collective list of 317 operations up to September 1919.



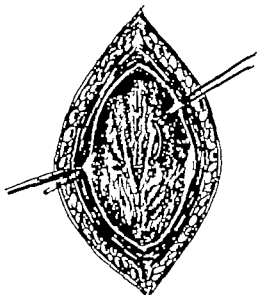


Fig. 73.—Second row of sutures obliterating the sac from below upward.

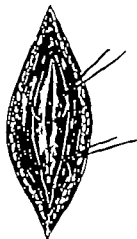


Fig. 74.—Completing suture of sac edges and muscle and fascia.

including 46 operations by the distinguished originator of the method. There were 14 deaths which could be attributed to postoperative causes, and 12 cases in which gangrene developed. Of the obliterative type there were 210 cases, 72 operations were done by the restorative technic, and 35 were reconstructive operations. There were 13 cases of secondary hemorrhage. These statistics amply confirm the favorable judgment long accorded to this method of treatment by American surgeons. In fact, it is a good many years since Dr W W Keen the Dean of the Surgical Profession of America, hailed it as the greatest contribution to the surgery of aneurysm since the days of John Hunter. It is unnecessary to recount its advantages. The subject has been exhaustively treated many times by Matas and others. If the student will study and ponder over the articles by Matas in Keen's Surgery he will derive a world of information in regard to all phases of vascular surgery from those mines of literary knowledge. It is interesting to note that in his last article on the subject in Keen's work (Vol. VII, Supplementary Volume) while laying stress on the importance of testing out the collateral circulation before operation and delaying the operation until the most favorable time, he stresses the adequacy of the obliterative operation in the majority of cases. He has no lack of confidence in the restorative and reconstructive operations, the safety of which seems amply proved by statistics, but finds that the necessity for their employment is met with less frequently than he formerly believed to be the case. This is especially true of the reconstructive operation. The restorative operation, or closure of a single orifice of communication between the vessel and the sac, is always performed when the conditions are favorable to such closure without occlusion of the lumen of the vessel. His careful study of war literature from all sources convinces him that the majority of arteriovenous aneurysms are susceptible to treatment by the intrasaccular suture and he quotes extensively from the literature to prove this. The methods employed by Bier, Küttner and other German surgeons in saccular traumatic aneurysms, in 50 per cent. of their cases were practically the Matas re

storative operation, great respect being paid to the aneurysmal sac. Similarly there is a growing tendency toward the adoption of the conservative suture methods among French and British surgeons, and the latter have been recently performing in the varicose type following gunshot injuries of artery and vein, what is essentially the transvenous route advocated by Matas and Bickham since 1904.

## LARGE STREPTOCOCCIC ABSCESS OF THE THIGH. STERILIZATION BY THE CARREL TECHNIC. SEC- ONDARY SUTURE

THIS boy nineteen years of age was admitted to the hospital three weeks ago. He is employed on the railroad, and one month before admission he fell and struck his right thigh on the end of a cross-tie. The next day he was quite sick, had headache, nausea and vomiting and developed severe pain and swelling in the thigh. He was treated at his home by a physician, and when admitted was in a septic condition. There was a huge swelling on the outer aspect of the thigh extending from the greater trochanter to the external condyle. Fluctuation was present over it, it was very tender and there was bleb formation on the overlying skin. The abscess was opened the same day by Dr Pfeiffer. The incision was about 14 inches in length and about 40 ounces of pus were evacuated. The collection was intermuscular and had no connection with the bone and no focus of infection could be found. The cavity was packed with gauze and several sutures inserted in the edges of the wound to keep it in and to control oozing. The culture showed the infection to be a hemolytic streptococcus.

Following this operation there was prompt improvement and fall in temperature. The wound was dressed daily and the packing was not disturbed for four days when it was removed. Carreling of the wound was begun on the sixth day after operation, twelve Dakin tubes being used for the instillation. Smears taken on this day showed two organisms per field. The treatment was controlled by smear and culture according to our usual practice. On the eighth day the smears showed no organism nor were any seen on the tenth, fifteenth and eighteenth days. Two cultures made on the fifteenth and eighteenth days respectively were negative. It may be assumed therefore that the wound is ready for suture.

The operative field including the wound, is carefully cleaned and sterilized, the skin being prepared separately. This preparation is done on the table the tubes being removed shortly before green soap, alcohol, ether and iodine follow in the order named. The wound undergoes the same preparation as the skin, following rigidly the technic of Le Maître. The wound itself is 12 inches in length, is of a typical clean red color with thin narrow blue epithelial borders, and extends deeply into the muscles on the outer aspect of the thigh (Fig. 75). The thin epithelial margin is removed with a little of the entire thickness of the



Fig. 75.—Streptococcal breach of thigh prepared by sterilization by the Carrel-Dakin method for secondary suture.

adjoining skin, completely circumscribing the wound with this incision, for which we use a sharp knife. Approximation of the wound edges is seen to be easy. The skin is, therefore, undermined around the wound for a limited distance only.  $1\frac{1}{2}$  inches in this case. The granulations are not removed, as they are not very thick, and the skin is sutured with silk-corn-gut and without drainage. The tension of the skin sutures is relied upon to secure approximation of the deeper planes (Fig. 76).

This procedure is of course a familiar one to practitioners

Photographs by Miss Klegston of the Presbyterian Hospital.

of military surgery Under laboratory control the secondary suture of infected wounds is a safe and almost certain procedure. One can count on about 95 per cent. of successes in a well-trained service. Its advantages in shortening convalescence, preventing excessive cicatricial tissue formation, and in bringing about a favorable end-result, when contrasted with cases allowed to heal by granulation were forcibly impressed on military surgeons mainly through the work of Le Maitre. It is equally

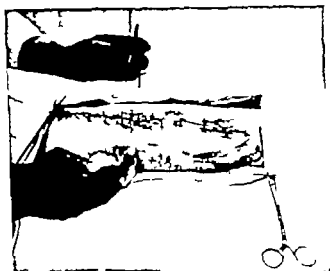


Fig. 74.—Appearance of wound immediately after completion of secondary suture.

applicable to civilian surgery. It requires a careful training of the house staff in the Carrel technic. The careful and orderly dressing of wounds which this requires is one of the best methods of training interns and nurses in exact scientific habits. The co-operation of laboratory workers is, of course a prime essential. With these requisites one finds that the routine employment of the Carrel technic gives results in lessened morbidity and early convalescence which must be seen to be appreciated.

Applied in a haphazard fashion it is valueless. We use it routinely in infected wounds.

The application of secondary suture to extensive cases of abscess and cellulitis of hematogenous or metastatic origin, and not associated with a wound, has yielded equally good results, where a sterile field could be obtained. We have several cases in the hospital at present which have been closed in this manner or are in process of sterilization. The shortening of the healing time and the minimum production of scar tissue are manifest advantages, to say nothing of a convalescence unattended by exhausting sepsis, and frequent complications and set-backs. Where bone involvement in the shape of osteomyelitis is present the time of healing is greatly reduced by the chemical sterilization of Carrel but it is seldom that we secure a field sterile for closure before the granulations have risen to the surface and the wound so narrowed that suture is unnecessary. In most soft part infections however this secondary suture is feasible. In streptococcal infections we insist on two cultures negative for streptococci before suture. Irrespective of the number of organisms per field seen in the smears. This precaution is necessary in dealing with all organisms growing in chains. In other types it is sufficient to get the bacterial count down to one in four fields in the smears to insure a good result.

[The wound was healed and the patient discharged sixteen days after suture.]

## TUBERCULOUS CERVICAL ADENITIS

THIS boy aged fifteen years, is sent to us for operation from a school for the deaf and dumb. He is not a case of congenital deaf mutism, but he lost his hearing completely about six years ago. Before that time he had been somewhat deaf and his eyesight was poor. He is now absolutely deaf and can only faintly distinguish light from darkness. He knows when the sky turns white. By reason of this combination of blindness and deafness his powers of receptivity are confined to the sense of touch and he has been so well instructed that his teacher carries on active conversation with him by finger touch. He bears the stigmata of congenital syphilis, flattened nose Hutchinson's teeth keratitis, etc. His serologic reaction is Wassermann positive. In addition to these great handicaps he developed some six months ago a swelling in the right side of his neck, which gradually increased in size. Other masses appeared in the same neighborhood, and two months ago abscesses developed in these enlarged glands, pointed, ruptured and have continued to discharge to the present time.

The right side of the neck shows a hard diffuse nodular swelling, extending from the angle of the jaw downward into the anterior triangle and beneath the sternomastoid muscle. There are three discharging sinuses, and the skin surrounding these openings is thin purplish, and ill-nourished (Fig 77). The polyglandular enlargement presents softened areas here and there, and the glands are evidently well fixed by periglandular inflammatory tissue. The picture is that of a case of tuberculous adenitis of the more advanced type corresponding to what Dr C. N. Dowd has designated as Group II and which includes

The illustrations are reproductions of drawings made by Mr. Faber at the time of operation.



those cases in which the disease has progressed beyond the favorable primary stage, and in which the original glands have supplicated and the abscesses have perforated the gland capsule, deep fascia and skin, while the lower glands of the jugular chain and those along the trapezius have become successively



Fig. 77.—This illustrates an extensive degree of glandular involvement, with invasion of the lower glands of the deep cervical chain, and abscess resulting from secondary abscess formation below the deep fascia.

enlarged. This indicates a lower power of resistance to the tuberculous lymphatic invasion than the milder and more limited examples of this disease and in this case where implanted on a soil already prepared by the loetic taint, the failure of the natural defensive powers is easily explained. In a number of

Dowd's cases such association of tuberculous adenitis with syphilis was observed. The combination offers no obstacle to radical treatment of the tuberculous glands, of which type of infection these present the typical history and clinical evidences. Incidentally the tonsils present no evidences of chronic infection and if as is usually the case, the tuberculous infection has found its entrance there, it has left no gross pathologic change behind it. Operation is urgently indicated and to be effective it must needs be radical and include the removal of the diseased glands in which the discharging sinuses have their origin.

The incision which we prefer in these cases and which has become the standardized one for operations on enlarged glands of a chronic type as well as for drainage of acute abscesses of inflammatory origin, is one which follows the natural creases of the neck. A curved incision of this character has the great advantage over the old type which follows the line of the sternocleidomastoid muscle, in that it does not undergo the stretching and hypertrophy and leave the disfiguring scar which is so commonly observed as a sequel of the latter. This advantage was pointed out many years ago by Kocher who always preferred incisions following the direction of the skin-fibers. Cosmetic results are of secondary importance in malignant disease, but in non-malignant infections and especially in this frequent operation and in this favorable and conspicuous locality the combination of a radical procedure with a good cosmetic result is much to be desired. In the great majority of cases it is possible to obtain a thin, white and very inconspicuous scar. Where the infection has reached the lower glands of the chain, two parallel incisions are usually better than one oblique incision. An additional oblique posterior incision within the hair line may sometimes be used for removal of glands in the upper portion of the posterior triangle.

In this case the diffuse nature of the glandular swellings and the necessity of including the sinuses in the incision compel us to modify somewhat the line of our incision and make it more oblique than we would wish, but it follows the general

direction of the skin-fibers sufficiently to overcome any marked tendency to stretching or hypertrophy.

We include in the primary incision the thin, ulcerated, and poorly nourished skin edges of the sinuses, and expose the underlying abscess above the deep fascia the contents of which are removed with sponge and curet. If we stop the operation at this stage it would constitute the so-called curetment, which has resulted in disappointment to so many operators and patients, and contributed so largely to the gloomy outlook which is still entertained in some quarters as to the prognosis of tuberculous adenitis. The causative factor remains to be dealt with. If we examine carefully we will find, as in this case a sinus perforating the deep fascia and communicating with a large gland beneath the upper portion of the sternomastoid muscle only the lower pole of the gland being broken down. Removal of this and the neighboring infected but still firm members of the chain is the next and most important step. For its proper performance a knowledge of the deep structures of the neck is of prime importance. Such knowledge demands careful study and a proper dissection in the face of a complicated pathologic condition such as we are here dealing with is a matter of time, care and patience. A number of important structures are in danger after the deep fascia has been divided and the sternomastoid muscle freed and retracted. Routine dissection will invariably uncover the internal jugular vein, to which the infiltrated glands are more or less intimately attached, and from which they must be carefully dissected. Wounds of its short branches result in free hemorrhage which calls for prompt control. Wounds of the vein itself may require lateral ligature suture, or ligation of the main vein, which has been safely accomplished many times and seems without special danger. In a large series of cases our single fatality has been one of secondary hemorrhage from the jugular which had not been ligated and Dowd in his much larger experience has had one death from the same cause. Dowd has collected 3 fatal cases following ligation of the jugular but has never observed it himself. The spinal accessory nerve is in danger and should be looked for and pro-

ected in glandular dissections in its neighborhood both before and after it perforates the sternomastoid muscle. In high dissections beneath the jaw avoid separating the platysma and the deep fascia, and make the incision through these structures below the line of incision through the skin. By this means we avoid a division of the branches of the facial nerve which drop into the neck below and parallel to the mandible and then run upward to supply the depressor labii inferioris. We have observed paralysis of this muscle in our early experience. Fortunately it is usually temporary.

A number of other important structures are in the immediate neighborhood of the glands in extensive operations but are rarely injured. Blunt dissection and working in a direction away from danger with a careful inspection of all suspicious structures before division, and a painstaking operative method will save the surgeon from some anxious experiences. Brilliancy of technic must be sacrificed to safety and thoroughness. If a double operation is indicated by involvement of both sides of the neck and the worst side be dealt with first, so much time may be consumed that a secondary operation on the opposite side will be the only safe procedure. A combination of adenectomy and tonsillectomy is ill advised. If the tonsils and adenoids are diseased and have not been removed beforehand as is sometimes the case, this procedure should be deferred to a later date, although not delayed long as secondary invasion of fresh groups of glands has been observed by us due to failure to remove the tonsils in time. The direct invasion of the glands by the tubercle bacillus traveling through the tonsils has been clearly demonstrated experimentally by Dr. George B. Wood.

We have now cleared the vein of the infected glands, uncovering both triangles of the neck, first the anterior and then the posterior and the anterior belly of the omohyoid can be seen crossing the anterior triangle (Fig. 78) and some of the superficial branches of the cervical plexus in the posterior triangle (Fig. 79). One of the latter has been accidentally divided in removing the gland surrounding it. This will result in temporary anesthesia only. All hemorrhage having been controlled the deep

fascia is united with interrupted sutures of fine catgut, and the skin is sutured with fine sutures of "equisetene," a suture material which combines something of the elasticity of horsehair with the strength of silk. Some provision for drainage is necessary here by reason of the capillary oozing from the extensive dissection, and the mixed infection present in the sinuses. For

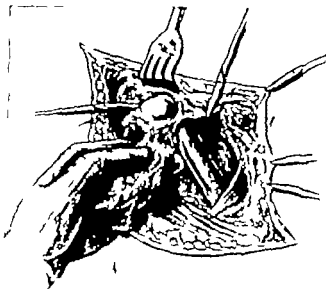


Fig. 78.—Dissection of deep glands, uncovering the internal jugular vein and structures in front of the sternocleidomastoid muscle. Tuck is retracted posteriorly. The uninvolved submandibular salivary gland is exposed beneath the jaw.

this purpose we use a small piece of rubber-dam or soft rubber tube in the posterior angle (Fig. 80)

We prefer to keep these children quiet for at least a week, and where possible in recumbent position to avoid disturbing the tissues during healing. Fortunately the wounds usually heal quickly even in the face of extensive caseation and cold abscesses (Fig. 81)

A fairly extensive experience with this operation has firmly convinced us of its curative value. It is true that cervical adenitis has offered a favorite field for the trial of many novel therapeutic methods. Every new form of treatment of supposed value in local tuberculosis has been advocated at one time or another as superior to operation, and asserted to be the method of choice. Each has eventually yielded the field to the

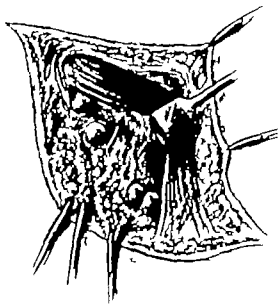


Fig. 79 —Dissection of the posterior triangle of the neck.

next method which is significant. The extravagant claims of the radium expert constitute one of the newer phases of this subject. For him the carefully studied statistics of investigators such as Wolgemuth, von Noorden Dowd Judd, and Mitchell with their ample proofs of the satisfactory results of operations properly performed, do not exist or are contemptuously dismissed. We quote from a recent article by Russell H. Boggs (*American Journal of Medical Sciences* cixi, pp. 90-95 July

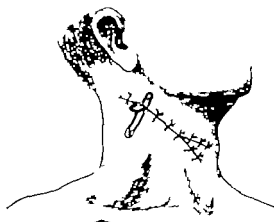


Fig. 80.—Appearance of wound at completion of operation.



Fig. 81.—Condition of wound, and practically complete healing at time of discharge from the hospital, fourteen days after operation. (Photograph.)

1921) which is an example of such extravagant statements, the harmful effects of which it is difficult to estimate

"Formerly radiotherapy was used in the treatment of tuberculous adenitis to avoid deformity and unsightly scars today this treatment is advised because more permanent cures are obtained than by any other method. At present surgeons of experience are not operating primarily for tuberculous adenitis. If they operate it is only to remove fibrous nodes after the tuberculous foci have been destroyed by Roentgen rays or radium. Then a dissection of the cervical glands is always contra-indicated. Radiotherapy alone will cure over 90 per cent. of the cases. This is the mildest of his statements. Arguments of this type simply demonstrate a complete ignorance of the results which can be obtained by proper operation. We cannot always grant these exponents of radium and x ray therapy the diagnostic ability to distinguish between the common form of hyperplastic adenitis which seldom calls for operation, and tends toward spontaneous healing under any form of therapy and tuberculous adenitis, for such important differentiation requires considerable surgical experience. We are inclined to believe that many of their cures are in the first mentioned class. It has long been recognized that the x ray has yielded disappointing results as we emphasized years ago and radium has no magic properties in this field that render it superior. Indeed, the fibrous encapsulation which follows radiation has rendered more difficult the radical operation which is finally necessary. As an effective contradiction to the assertion of Boggs that surgeons of experience no longer operate primarily for tuberculous adenitis I will quote from a recent personal communication from Dowd who is the leading authority on this subject and whose latest paper on it is based on a study of 687 cases operated upon by him or his associates and assistants and which covers a period of twenty two years.

"As to the treatment of tuberculous cervical lymph-nodes I believe very strongly in surgery and regret that the subject of recent years has been so much befuddled by statements which show only one side of the subject. I know of no place in the human body where tuberculosis offers so good a prospect of permanent cure as in neck infections. Operations are wonder



fully satisfactory in children. As they used to come to me at St. Mary's Hospital, we could confidently expect a cure by one operation in about 85 per cent. of the cases and in a large portion of the remainder a cure followed a secondary operation. These cases were followed through many years, some of them as many as twenty.

"If the disease is permitted to run into adult life and involves very extensively not only both sides of the neck but also other parts of the body the results of operation are less favorable. Even in the adult cases surgery is probably the most efficient method. It may be followed by some form of radiation, if necessary.

"The whole subject has suffered from the types of operation which have been common. The opening of an abscess or a little curetting have often been called operation, whereas they do not represent proper surgical treatment of the disease. A thorough operation in a child with moderate involvement of the cervical lymphatics of one side can be done in one-half or three-quarters of an hour. The mortality rate is almost nil. The scar is hardly to be found but the dissection should be carried so as to include the groups of glands which are centered about the upper part of the internal jugular vein and they should be cleanly removed.

"In adults the operation has been done even less thoroughly and a vast number of partial excisions have been resorted to. There is no reason to expect that these partial excisions would be curative. The operation is tedious, requires a very accurate anatomic knowledge, and is generally avoided by the busy surgeons who are in charge of the large hospital services. They are very willing to turn them over to the younger men or refer the patients to any form of treatment which offers a fair prospect of success. It is particularly unfortunate that in doing this they have condemned many children to forms of treatment which offer little prospect of satisfactory cure. We cannot express more tersely the principles underlying the successful operation for tuberculous adenitis in the neck.

Tuberculin has its advocates, and it is true that some strike

ing cures and improvements are sometimes observed following its administration. It is a tedious, prolonged treatment, and we believe that better results can be much more quickly obtained by operation, and with a much greater degree of certainty. We would reserve its use for the extensive double cases most often seen in adults, and often combined with some degree of pulmonary or other visceral involvement, in which radical surgery is no longer possible, and in which the natural defenses of the individual have been completely broken down. As an adjuvant to surgery it has its place, but as a substitute for it is lacking in efficiency in the great majority of cases.

It is well to reiterate that one should not undertake an operation on the glands in the neck without ample time, ample assistance and ample patience. If the surgeon has these, has studied the operation, and has mastered his anatomy he will, as his experience in this field grows feel a glow of satisfaction with the completion of a difficult operation not exceeded by that attending some other more brilliant but less difficult operations in, let us say the field of abdominal surgery.



## CONTRIBUTION BY DR. WARREN B. DAVIS

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### HARELIP AND CLEFT PALATE CASES

MANY types of operations have been devised during the past sixty years for the correction of harelip and cleft palate deformities. There has also been much discussion as to the best time for operation and the proper sequence of step or stage operations.

During the past six years Dr. J. Chalmers DaCosta has very kindly given me the privilege of operating upon all harelip and cleft palate cases admitted to his service—Surgical Division A—at Jefferson Hospital. We have not endeavored to devise any new operations for the correction of the various types and varying degrees of deformities in these congenital defects, but rather to study carefully the methods already described and to try the relative merits of those impressing us as being the most practical in such selected cases as seemed best adapted to a particular type of operation. Following this course during the earlier years we have assembled and now use what might be termed a composite technic, in which we have taken from several sources such parts of methods as we found to be an aid in securing the best results in our cases. Thus considering our present methods as hybrids, one recognizes characteristics chiefly descended from the basic principles and procedures evolved by Langenbeck, J. Ewing Neare, W. J. Roe, G. V. I. Brown, V. P. Blair, W. A. Lane, E. Owens, J. B. Roberts, J. E. Thompson, J. S. Davis, Berry and Legg plus which are the variations, modifications, and some minor additions which naturally develop as a personal element in surgical work.

We shall consider here a few cases showing some of the varieties of conditions found their surgical treatment, and the results obtained.

Case I.—Unilateral harelip with cleft through alveolar process, but not extending into horizontal portion of the palate. Private patient, J M male, age twelve months, referred by Dr J B Lowmca.

Cleft extended through left side of lip almost to the floor of the nostril (Fig 82) Between the upper angle of the cleft



Fig 82—Case I. J M. Age twelve months. Showing unilateral harelip deviation of nasal septum to the right, and moderate flattening of left nostril.

and the floor of the nostril there was no muscle tissue between the labial mucous membrane and the skin. There was narrow cleft through the alveolar process (Fig 83) but it did not involve the horizontal portion of the palate. There was slight anterior rotation of the left side of the premaxilla. Nasal septum deviated to the right. Moderate flattening of left nostril.

Operation June 30 1921. The mucous membrane was removed from the margins of the cleft in the alveolar process,

after which pressure was applied on the premaxilla and also against the lower portion of the right side of nasal septum by means of a small Sinexon nasal dilator thus forcing the raw surfaces of the margins of the alveolar cleft into contact. No suture was used to hold these surfaces in contact because of the narrowness of the cleft, and the effect of the continuous light pressure and traction to be obtained by correction of the lip defect.



Fig. 83—Case I. Showing narrow cleft through alveolar process, but not extending into the horizontal portion of the palate. Note absence of muscle tissue between upper margin of cleft in the lip and the floor of the nostril.

Points for making incisions in the lip were then marked out by the Thompson method which we have found to be of the greatest assistance in securing accurate measurements of surfaces for approximation. With a pair of dividers (calipers) regulated with a screw the distance was taken from the mid-point of the lower margin of the nostril to the estimated point in the same sagittal plane where the free margin of the lip should be to make the lip of normal contour (Fig. 84). Fixing this

distance on the dividers, one point of the dividers was held at the original midpoint of lower margin of nostril, while the other was rotated until the described arc crossed the vermillion border on each side of cleft, a puncture being made on the skin surface just above the vermillion borders to mark these points. Points were then located on the free margins of the lip as shown in Fig. 84. The lines connecting the point above the vermillion border and that on the free edge of the lip should be at approximately an angle of 70 to 80 degrees with the lateral lines. The angles should be equal on each side, and since the corresponding lines for incisions on each side are definitely known to be of



Fig. 84.—Schematic sketch of Case I showing Thompson method of determining lines for incisions for the correction of harelip, as described in the text.

equal length, one is sure of accurate even surfaces for approximation.

Temporary traction sutures of silk (see Fig. 94) passed through the entire thickness of the lip about  $\frac{1}{4}$  inch lateral to the points marked at the vermillion borders, we find to be of much assistance in handling the lip producing much less trauma than when forceps of any kind are used. The margins of the cleft in the lip were then removed with a small scalpel passed through the entire thickness of the lip and carried along lines connecting the points determined by measurements described above. Carrying the incisions to the floor of the nostril permitted approximation of muscle tissue throughout the entire length

of lip (which is essential to full function) and aided in also correcting the flattening of the ala nasi. The surfaces thus exposed on the two sides of cleft are of the same length, and when approximated will produce a lip the length of which will be the estimated normal length plus the distance from the vermillion border to the free edge of the lip. This is usually just enough to allow for subsequent contraction in the suture line.

The lip and the cheek on each side were then freed from the attachment to the anterior surface of the maxilla by an incision (most conveniently made with curved scissors) above the alveolar process, and the tissues loosened sufficiently to allow the sides of the cleft to be approximated without undue tension, and, equally as important, to allow the ala of the nostril to be brought into approximately the normal contour at the floor of the nostril. We applied our first suture (00 catgut) through the mucous membrane surface of the lip at the floor of the nostril. Next a black silk suture was placed exactly through the vermillion borders and another at the free margins of the lip. Additional sutures of horsehair and fine silk were used as needed to accurately approximate skin margins, and on the lower mucous membrane surface usually two silk or fine catgut sutures complete the operation.

Figure 85 shows the case four hours after operation. No dressings were used in the after treatment, the lip being simply cleansed with boric acid solution and aristol powder lightly applied on suture line three times a day. The more superficial sutures were removed on fourth day. All skin sutures were removed by the eighth day after which time sterile vaselin was applied over the suture line night and morning for two week. Figure 86 shows the appearance of the lip and the nostril January 12 1922 six and one half months after operation.

Case II.—Unilateral harelip and complete single cleft palate. H. E. F. male age five months, referred by Dr. John L. Arnold, Harrisburg, Pa. Admitted to Children's Ward on Dr. Da Costa's service.

As shown in Fig. 87 there was complete unilateral harelip with widely separated margins, and consequently marked





Fig. 25.—Case I four hours after operation. Note position of sutures, the fulcrum of the lip to the free margin, and the even approximation of the vermillion border.



Fig. 26.—Case I six and one-half months after operation.

flattening of the ala of left nostril. The cleft in the palate was complete on the left side. The margin of the premaxilla was rotated anterosuperiorly. The nasal septum was markedly deviated to the right.

Operation December 16 1919. At this operation the margins of the cleft in the alveolar process were approximated and the harelip repaired. With a small drill a hole was made on each side through the upper portion of the alveolar process, about  $\frac{1}{8}$  inch from left side of cleft, and  $\frac{1}{8}$  inch from the right side.



Fig. 87.—Case II. Unilateral harelip and complete single cleft palate.  
H. E. F. male, aged five months.

A silver wire was passed through these openings, similar to method shown in Fig 92. With a thin chisel the alveolar process on the right side was partially divided on its buccal surface just posterior to the canine region. The mucous membrane was then removed from the margins of the alveolar cleft so that, when they were approximated raw surfaces would come in contact. The premaxilla was then brought into proper position by combining firm pressure with thumb on the antero-superior portion of alveolar process, with pressure against the lower portion of the nasal septum and the floor of the nostril

by means of a Sinexon nasal dilator. This pressure allowed approximation of the alveolar surfaces—a green-stick fracture occurring at the point on the right side marked by the partial division of the alveolar process mentioned above. The parts were held in this position while the silver wire was tightened, twisted, cut, and the ends bent slightly upward to prevent subsequent irritation of the tongue. This approximation of the alveolar margins brought the margins of the cleft in the lip much closer together after which the deformity of the lip and



Fig. 84.—Case II twenty-two months after first operation. Note good union of alveolar process and the satisfactory position of teeth.

nostril was corrected in practically the same manner as that described for Case I. Convalescence was uneventful. Began removing sutures from the lip on the fifth day. All sutures were removed by the tenth day. Silver wire was removed from the alveolus on the sixteenth day. Operation on the palate was advised when patient was seventeen months old. He was not returned however until twenty-seven months old. Figure 85 shows the type of union of the alveolar process which had been obtained and the very satisfactory position of the

teeth. Compare position of alveolar process with that shown in Fig 87

Second operation October 7 1921 Repair of cleft palate and correction of a slightly excessive prominence of free margin of lip at the point of union secured by the first operation.

Closure of the cleft in the palate was by a modified Langenbeck method. An incision was made on each side just medial to and parallel with the posterior portion of the alveolar process. The incisions were carried down to the bone. The mucoperiosteal flaps were then separated from the bone by use of slightly dulled curved periosteal separators of different sizes and angles to fit the varying concavity of different portions of the palate surface. After partially separating one side, placing cotton saturated with 1 1000 adrenalin solution beneath the loosened mucoperiosteal flap materially decreases the bleeding and does not prolong the operation, since work is continued on the opposite side until a similar stage is reached after which adrenalin applications alternate as needed. On the right side, where the palate was attached to the nasal septum the separation of the mucoperiosteal flap was carried around the lower portion of the septum, thus allowing about  $\frac{1}{4}$  inch of septal mucosa to be included in the palate flap (This additional width of flap assisted greatly in making the approximation at the anterior portion of the cleft relatively an easy procedure.) After the separation on the opposite side was carried through the margin of the cleft, the next step which we employed was to separate the flaps from the nasal mucosa, by dividing along the posterior edge of the palate bone. This we find is most easily and accurately done and with least trauma by passing a slender separator from the site of the primary incision, carrying it beneath the previously loosened mucoperiosteal flap and through the opening which has been made in the cleft margin. Pressing the separator posteriorly it serves, first, in locating the posterior edge of the palate bone and then as a guide beside which a small narrow scalpel or a tenotome, may be carried and the nasal membrane divided along the posterior edge of the bone from margin of the cleft to a point as far lateral as is necessary

to secure the relaxation desired. (Moorehead, Jour Amer Med. Assoc. December 17 1921 is opposed to this step of the operation, regarding it as "the most frequent cause of non-union," but certainly it has not proved so in our series. On the contrary in a few of our early cases in which there was incomplete union from the first operation there was an oval opening at a point corresponding to the junction of the hard and soft palate which opening we are now convinced was due to insufficient division of the nasal mucosa for relaxation of the mucoperiosteal flaps.)

The margins in the soft palate portion of the cleft were denuded by removing the marginal mucous membrane, but including with it as little muscle tissue as possible. We used for approximation of the mucoperiosteal flaps interrupted sutures of 00 wire from the anterior point of the cleft to the beginning of the soft palate. At this point a single on-end mattress suture of silk was used. (On-end mattress sutures give a nice approximation of the margins at the time of operation, but our experience has been that, where several of them have been used, they interfered to a considerable extent with the circulation in the edges of the flaps sometimes causing incomplete union and sometimes predisposing to the formation of a slough. Thus at the present time we use only one suture of this type.) Posterior to this point interrupted sutures of fine black silk were used. Small iodoform gauze packs were placed in the lateral incisions to relieve tension. These were removed in forty-eight hours. Some of the sutures were removed on the tenth day the remaining ones on the twelfth and fourteenth days. Union was complete throughout the entire length of the hard and the soft palate.

Postoperative treatment consisted in giving only an abundance of water by mouth for the first twenty hours then liquid nourishment for eight days, after which semisolids were added to the diet. Ten drops of 15 per cent. argyrol solution were applied in each nostril every four hours. No applications or sprays were used in the mouth. (In older children and in adults we do routinely use normal salt solution as a gentle mouth

wash followed by intra-oral applications of argyrol along suture line and in lateral incisions, but in infants and very young children we have found more harm resulting from the fretting and crying incident to making such applications than we believed was balanced by any benefit obtained from the mildly antiseptic effect of the solution applied.)

Figure 89 shows the appearance of the lip and the nostril January 15 1922. The child is now learning to talk, and the distinctness of his articulation and the quality of his voice



Fig. 89.—Case II twenty five months after operation. Note contour of lip and nostril

show the advantage of having early and complete repair of the lip and the palate.

CASE III.—W. S., male age three months, referred to Dr DaCosta's service by Pediatric Department. This case showed double harelip incomplete on right side and double cleft palate, also incomplete on right side. There was anterosuperior rotation of the left margin of the premaxilla (Fig. 90) (The formation of the palate on the right side is unusual (Fig. 91) in that the horizontal process of the right maxilla does not extend



Fig. 90.—Case III. Age three months. Double lower lip and cleft palate, incomplete on right side.



Fig. 91.—Case III, showing type of cleft in palate.



Fig. 92.—Case III. Sketch showing position of wire passed through upper portion of alveolar process. The wire passes between the premaxilla and the philtrum, through an opening made just anterior to the bone, thus disturbing neither the attachment of the frenulum nor the developing teeth.

more than half way to the lower border of the upper yet the interval between the medial edge of the bony horizontal process

and the vomer is filled with very irregularly placed or unevenly folded mucous membrane and a small amount of soft sub-mucous tissue between the oral and nasal mucosa.) Some of the deformities shown in this patient are similar in character to those shown in Case II, but the case is presented here in order to show by illustration some of the detail of operative procedures as sketched by Mr. Faber at the operation on January 10 1922



Fig. 92.—Case III Sketch showing partial division of alveolar process on right side just posterior to canine region. The mucous membrane has been removed from the margins of the cleft in the alveolar process to secure raw surfaces for approximation. Approximation has been made by combined inferolateral pressure on the premaxilla and on the lower portion of the nasal septum by Bennett nasal dilator. Silver wire is tightened while parts are held in position. This part of the operation not only closes the cleft in the alveolar arch but also decreases to great extent the nasal deformity.

The operative procedures are described in the legends accompanying the sketches. The closure of the remaining portion of the cleft in the palate in such a case is preferably done when the child is between fifteen and twenty months old—selecting a time when the child's general condition is good.

Case IV—Ago three months. From Dr. DaCosta's service. This case shows complete double harelip and double cleft palate





Fig. 90.—Case III. Age three months. Double lower lip and cleft palate, incomplete on right side.



Fig. 91.—Case III showing type of cleft in palate.



Fig. 92.—Case III. Sketch showing position of silver wire passed through upper portion of alveolar process. The wire passes between the premaxilla and the philtrum, through an opening made just anterior to the bone thus disturbing neither the attachment of the frenulum nor the developing teeth.

more than half way to the lower border of the former yet the interval between the medial edge of the bony horizontal process

and the vomer is filled with very irregularly placed or unevenly folded mucous membrane and a small amount of soft sub-mucous tissue between the oral and nasal mucosa.) Some of the deformities shown in this patient are similar in character to those shown in Case II but the case is presented here in order to show by illustration some of the detail of operative procedures as sketched by Mr. Faber at the operation on January 10 1922



Fig 93.—Case III Sketch showing partial division of alveolar process on right side just posterior to canine region. The mucous membrane has been removed from the margins of the cleft in the alveolar process to secure raw surfaces for approximation. Approximation has been made by combined inferolateral pressure on the premaxilla and on the lower portion of the nasal septum by Stensen's nasal dilator. Silver wire is tightened. The parts are held in position. This part of the operation not only closes the cleft in the alveolar arch but also decreases to a great extent the nasal deformity.

The operative procedures are described in the legends accompanying the sketches. The closure of the remaining portion of the cleft in the palate in such a case is preferably done when the child is between fifteen and twenty months old—selecting a time when the child's general condition is good.

Case IV—Age three months. From Dr. DuCosta's service. This case shows complete double harelip and double cleft palate

with anterosuperior rotation of premaxilla, as shown in Figs. 96-98. The sketches made by Mr. Faber at the operation, January 14, 1922 illustrate the steps of the operation described in the accompanying legends. Operation for closure of the remaining cleft in the palate will be advised when the child is between fifteen and twenty months old. So wide a cleft in the palate will probably require a two-stage operation—the first



Fig. 94—Case III. Measurements have been made on the lip margins by the Thompson method to determine loss of lockstep. The philtrum has been trimmed to V shape just behind the vermillion borders. Temporary traction sutures have been placed just lateral to the points above the vermilion border outlining incision lines. These traction sutures are said to be of great assistance in handling the lip during operation, producing less trauma to the tissues than is caused by the use of forceps of any type which have employed.

loosening the mucoperiosteal flaps through Langenbeck incisions and partial approximation made by lateral packs for several days after which approximation of the margins of the cleft may be completed with much less tension to contend with.

Case V—E. P. age four years. From Dr. DaCosta service. Examination showed bilateral harelip (complete on right side incomplete on left) and double cleft palate (complete on right

side and extending to but not through alveolar process on left side) as shown in Fig 104. There was moderate antero-superior rotation of right side of the premaxilla.

Operation January 26 1920. The first operation was to close the cleft in the alveolar process and to correct the double harelip. The rather firm ossification of the maxillæ and the



Fig 95.—Case III. Shows incisions completed and tissues ready for approximation. After this stage the two most important sutures to be placed are the one to approximate the tissue which completes the formation of the floor of the nostril, and the other passing through the vermilion border of the flaps. Catgut sutures are used to bring muscle tissues in apposition and to approximate mucous membrane surfaces, alternating black silk horse-hair sutures to approximate skin surfaces. A serviceable mattress stay suture is shown passing from the lateral margins of the cleft through the lower portion of the philtrum in which manner accurate coaptation of both skin and mucous membrane surfaces when the suture is tightened.

articulating bones in a patient of this age or older makes the closure of the alveolar cleft much more difficult than in infants or younger children. In this case closure was effected by sub-mucous resection of a small quadrilateral piece of the lower portion of the vomer and the nasal cartilage (through an incision made in the mucous membrane on the inferior surface of the vomer just posterior to the premaxilla) and the partial

with anterosuperior rotation of premaxilla, as shown in Figs. 96-98. The sketches made by Mr. Faber at the operation, January 14, 1922, illustrate the steps of the operation described in the accompanying legends. Operation for closure of the remaining cleft in the palate will be advised when the child is between fifteen and twenty months old. So wide a cleft in the palate will probably require a two-stage operation—the first



Fig. 94.—Case III. Measurements have been made on the lip margins by the Thiersch method to determine lines of incision. The philtrum has been trimmed to a V shape just within the vermilion borders. Temporary traction sutures have been placed just lateral to the points above the vermilion border outlining incision lines. These traction sutures find to be of great assistance in handling the lip during operation, producing less trauma to the tissues than is caused by the use of forceps of any type which we have employed.

loosening the mucoperiosteal flaps through Langenbeck incisions and partial approximation made by lateral packs for several days, after which approximation of the margins of the cleft may be completed with much less tension to contend with.

Case V.—E. P. age four years. From Dr. D. Costa service. Examination showed bilateral harelip (complete on right side, incomplete on left) and double cleft palate (complete on right

side and extending to but not through alveolar process on left side) as shown in Fig 104. There was moderate antero-superior rotation of right side of the premaxilla.

Operation January 26 1920. The first operation was to close the cleft in the alveolar process and to correct the double harelip. The rather firm ossification of the maxilla and the



Fig 93.—Case III. Shows incisions completed and tissues ready for approximation. After this stage the two most important sutures to be placed are the one to approximate the tissue which completes the formation of the floor of the nostril, and the other passing through the vermilion border of the flaps. Catgut sutures are used to bring muscle tissue in position and to approximate mucous membrane surfaces, alternating black silk horse-hair sutures to approximate skin surfaces. A serviceable mattress stay suture is above, passing from the lateral margins of the cleft through the lower portion of the philtrum in a way which ensures accurate coaptation of both skin and mucous membrane surfaces when the suture is tightened.

articulating bones in a patient of this age or older makes the closure of the alveolar cleft much more difficult than in infants or younger children. In this case closure was effected by sub-mucous resection of a small quadrilateral piece of the lower portion of the vomer and the nasal cartilage (through an incision made in the mucous membrane on the inferior surface of the vomer just posterior to the premaxilla) and the partial

division of the alveolar process on the left side posterior to the canine tooth. This allowed the premaxilla to be forced postero-



Fig. 96—Case IV. Age three months. (From Dr. DuCoudré's collection.) Complete double harelip and double cleft palate.



Fig. 97—Case IV. Showing anteroposterior rotation of the premaxilla and the short columella and philtrum.



Fig. 98—Case IV. Showing complete double cleft of the palate.

laterally bringing the margins of the cleft into apposition. The mucous membrane was removed from the margins of the alveolar cleft to allow raw surface contact. Part were held in

contact by a single silver wire suture through upper portion of alveolar process.

The incomplete cleft in the left side of lip was made into a complete one to secure apposition of muscle tissue throughout

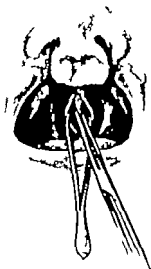


Fig. 99.—Case IV. Sketch shows position of incision for removal of lower portion of osseous and anterior portion of nasal cartilage by submucous resection. A triangular section of bone and cartilage was removed to allow inferoposterior rotation of premaxilla to its normal position. The length of the base of the triangular piece of bone and cartilage removed is determined by the amount of rotation which the premaxilla requires, and should be such that when the premaxilla comes into proper position the sides of the triangle will be brought together. There will be bulging of the mucoperiosteum at this point for several days, but the excess tissue soon resorbs.

and to secure a better floor of the nostril and to bring muscles into contact. The philtrum was trimmed to a V shape, removing the vermilion border. Incisions were carried inferolaterally into the lateral portions of the lip after the method of E. Owens. The lip was separated from anterolateral surfaces of the maxilla





Fig. 100.—Case IV. Shows silver wire passed through alveolar process and between the philtrum and premaxilla.



Fig. 101.—Case IV. Lateral margins of premaxilla and the margins of alveolar process have been trimmed to allow accurate approximation of raw surfaces. Silver wire has been tightened to hold premaxilla in proper position.

to allow approximation of lip margins and the correction of the nasal alae deformities without undue tension. The margins of the cleft were approximated by interrupted catgut sutures on the mucous membrane surface, and by interrupted black silk sutures on the skin surface and at the inferior margin of the lip. No widely placed stay sutures were used in this case. Ten

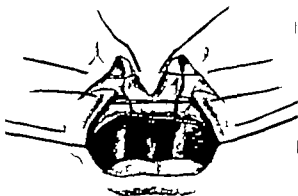


Fig. 102—Case IV. Measurements have been taken according to the Thompson method, and margins of the cleft in lip are shown ready for approximation. The use of temporary traction sutures shown inferolateral to nostrils and in decreasing tension from handling lip during operation. 00 catgut sutures are used to approximate mucous membrane surfaces. After suturing black silk and horsehair sutures are used on the skin surface and at free edge of lip.

sion on suture lines was decreased by adhesive strips carried from anterior portion of each submaxillary area to the supra-orbital and frontal region on the opposite side the strips crossing over the bridge of the nose. (We now find widely placed abotted stay sutures of silkworm-gut more efficacious in such cases than the adhesive strips.)

The lip became infected about the fourth day the infec



Fig. 100.—Case IV. Shows silver wire passed through alveolar process and between the philtrum and premaxilla.



Fig. 101.—Case IV. Lateral margins of premaxilla and the margins of alveolar process have been trimmed to allow accurate approximation of new surfaces. Silver wire has been tightened to hold premaxilla in proper position.

result we now avoid by making more accurate measurements for the incisions by the Thompson method described above.

Second operation August, 1921 The remaining cleft in the hard and soft palate was closed by the Langenbeck method. The anterior half of the cleft remained closed but the margins of the posterior portion separated, necessitating a third operation. A probable factor in causing the posterior separation was the pressure and manipulation which was necessary on the eighth day after operation to control a profuse hemorrhage



Fig 104.—Case V. E. P. Age four years. From Dr. DeCosta service.  
Bilateral harelip and cleft palate—bicompleta on left side.

from the left posterior palatine artery. Pressure and iodoform gauze packs controlled the bleeding the packs being removed the following day. Another equally profuse hemorrhage occurred on the fourteenth day after operation, which again required firm packing. This is the only case in my series in which a secondary hemorrhage has occurred.

Third operation October 27 1921. Figure 106 shows the anterior extent of the remaining cleft in the posterior portion of the palate. The contour obtained in closing the cleft in the alveolar process is also shown. The cleft in the posterior por-

tion beginning on the mucous membrane surface and extending into all suture lines. I believe the chief causative factor in this infection was my failure to have the teeth properly cleaned



Fig. 103.—Case IV. Showing further stage of approximation and completion of suturing. The rotation of the premaxilla and the short columella and philtrum cause depression of the tip of nose for a few days. This condition usually shows daily improvement, and in a few weeks the tip of the nose will be in approximately its normal position. (See Case VI at same day after operation, Figs. 110, 111.)

and some decayed teeth filled or extracted before operation. The lip healed in spite of the infection, but a larger amount of scar tissue resulted (Fig. 105) than would otherwise have occurred. Figure 105 also shows the upper lip is too long. This

attached to the horizontal processes of the maxillæ in their anterior portion (Fig 109) thus allowing the nasal septum and the attached premaxilla to be readily moved from side to side.

We first examined this condition when the child was four days old. Postponement of operation was advised until it was determined that a suitable feeding formula had been selected and the baby was stronger and gaining weight.

Operation December 20 1921. An incision was made in the midline on the inferior margin of the vomer just posterior



Fig 107—Case VI. G. H. Male. Age six weeks. Showing bilateral harelip and bilateral clefts through the hoola process with marked anterosuperior rotation of premaxilla.



Fig 108—Case VI. Showing degree of anterosuperior rotation of premaxilla. Note shortness of the columella and philtrum.

to the premaxilla. The mucoperiosteum and the mucoperichondrium were separated from the anterior portion of the vomer and the nasal cartilage to allow submucous removal of a triangular section of the bone and cartilage of sufficient size to permit inferoposterior rotation of the premaxilla to its normal position. The mucous membrane was removed from the margins of the alveolar process and also the anterior margin of the palate. The lateral surfaces of the premaxilla were removed in a way to make it keystone shaped and to fit snugly into its proper position in the alveolar arch. The mucous mem-

tion of the hard palate and through the soft palate was again closed by the Langenbeck method, and good union was obtained. Articulation is improving, but to obtain good speech will necessitate much more training than is required in the cases where closure of lip and palate defects are completed before the end of the second year.



Fig. 105—Case V. Showing appearance of lip and nostrils twenty-two months after first operation. Excess scar tissue in lip as result of infection which occurred in suture line.



Fig. 106—Case V. Showing contour of alveolar process and position of teeth twenty-one and one-half months after first operation (tw and one-half months after second operation). Opening shows in posterior portion of palate was closed by the third operation.

**Case VI.**—G. H. male, age six weeks. Referred by Dr. Hugh Baker Vineland N. J. and Dr. P. Brook Bland. Admitted to Dr. DaCosta's service.

This very unusual case had complete bilateral harelip and bilateral clefts through the alveolar process, with marked antero-superior rotation of the premaxilla but with well-formed palate posterior to the region normally occupied by the premaxilla (Figs. 107-109). The rumer was elongated and was not

harelip was then repaired using the Thompson method for outlining positions of incisions in lip

A single stay suture of silkworm-gut was used to avoid tension on the suture lines, the suture being carried *far lateral* and held at desired tension by perforated shot over a button and adhesive plaster as used by G. V. L. Brown.

Figures 110 111 show condition and form of lip nostrils, and tip of nose January 5 1922, *sixteen days* after operation. At the time of operation the tip of nose was drawn far downward and flattened by the traction on the short columella and philtrum. The columella, however has increased daily in length, and in a few more days will allow practically normal position of the tip of nose. The silver wire suture was removed from the alveolar process on the *sixteenth day* at which time the union of the premaxilla was firm both laterally and posteriorly and the outline of the alveolar arch was of good contour



brane on its posterior surface was removed along the line coming in contact with the horizontal portion of the palate to obtain raw surfaces for approximation. The premaxilla was held in



Fig. 109—Case VI. Showing well-formed palate posterior to the area normally occupied by the premaxilla.



Fig. 110—Case VI sixteen days after operation, showing the rapidity with which the tip of the nose is coming into normal position as the columella lengthens.



Fig. 111—Case VI sixteen days after operation, showing contour of lip and nostrils.

this position by a single silver wire suture passed through antero-lateral portions of the alveolar process, passing in front of the premaxilla, between the bone and the philtrum. The double

## CLINIC OF DR. JOHN SPEESE

### PRESBYTERIAN HOSPITAL

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#### HEMANGIO-ENDOTHELIOMA OF SPLENIC FLEXURE

THE patient, a boy sixteen years of age, was first admitted to the Presbyterian Hospital June 23 1921 with the following history On June 20th he had an attack of pain dull in character continuous, and located in the lower portion of the abdomen. He has been unable to eat and has vomited all food since the attack began. He has been constipated and the remedies used at home were more or less ineffectual.

Upon admission, June 23d there was much tenderness over the whole right side of the abdomen the leukocytic count was 13,500. A diagnosis of appendicitis was made and operation immediately performed. The appendix was found kinked and acutely inflamed in addition there was a small amount of straw-colored fluid in the abdomen. Examination of the abdominal cavity elsewhere showed nothing of significance.

The patient made an uneventful recovery and left the hospital July 5th. During the summer he gained considerable weight and felt perfectly well until September when he began to experience attacks of sharp pain in the left hypochondriac region. The pain, while severe was of short duration, and at times was followed by vomiting. His bowels have been regular since he left the hospital in July. On October 4th the patient had a severe chill which lasted one-half hour the chills have persisted, occurring two or three times a day and the patient has remained in bed since their development. He has not noticed any frequency in urination although the pain seems to be in the region of the left kidney.

The past medical and family histories are negative in so far



dary anemia so that two blood transfusions were given, with temporary benefit. On November 10th the drainage became fecal in character and later small amounts of fecal matter were discharged from the sinus. There has been no vomiting no constipation only a few days before death was there much distention of the abdomen.

Discussion.—The question naturally arises in this case as to whether the intestinal growth was present at the time of the first operation in June. A thorough search was made because it seemed that the appendical inflammation was insufficient to account for the amount of fluid present. It is doubtful if such a thorough examination would otherwise have been made as the symptoms were entirely explained by the presence of the inflamed appendix. Furthermore a period of three months elapsing before symptoms referable to the new growth indicate that the tumor developed after the first operation or was in an extremely early stage at that time.

Sarcoma of the intestine simulating appendicitis has been mentioned by several writers. In Libman's paper he refers to three instances in which sarcoma of the small intestine assumed a clinical picture similar to that of appendicitis. There are numerous instances recorded of tumors of the cecum producing symptoms simulating inflammation of the appendix, but I am unaware of sarcomata in the large intestine causing such a clinical picture.

Attention is directed to the fact that pain and fever were the most significant of the early manifestations of the disease, and that symptoms referable to the gastro-intestinal tract were altogether inconspicuous. The autopsy findings of multiple abscess formation in the liver would seem to be a complication occurring after the operation performed in October although the septic course immediately before and subsequent to the operation was undoubtedly due to mixed infection arising in the rapidly growing and necrotic tumor tissue. Spread of the infection was probably favored by the vascularity of the tumor.

In briefly reviewing the subject of sarcomatous growths of the intestine I shall quote from the paper by Jopson and White

as the present illness is concerned, and the general physical examination shows no abnormalities with the exception of the abdomen. In the splenic region there is great tenderness, and a small mass apparently attached to or in, the lower border of the spleen can be elicited.

The blood count October 14th, R. B. C. 5,020,000 W. B. C. 10,700 Hb. 70 per cent. Widal reaction and examination of the blood for malaria negative. On October 21st the leukocytes were 15,150 of which 98 per cent. were polymorphonuclear. The urine was negative.

A tentative diagnosis of a suppurative collection in or about the spleen was made and on October 24th the abdomen opened through a left rectus incision. A mass in the upper quadrant was found, the intestines easily packed off disclosing the omentum tightly adherent to the spleen. An abscess of the spleen could not be demonstrated although the omentum was partially freed with this object in view. Coursing over the outer surface of the spleen and continuous with the mass above were large numbers of greatly engorged blood vessels, some of which were torn in releasing the omentum. At this stage of the operation the tumor was regarded as an angiosarcoma probably arising in the spleen or kidney and inoperable, owing to the extreme vascularity and dense adhesions. A small drain was inserted, however as the possibility of a collection of pus was not excluded.

The following day a large amount of pus was discharged through the tube. The bacteriologic examination revealed a pure culture of *pseudotetanus bacillus*.

The postoperative course for five days was quite favorable there were no chills, and the temperature seemed to be subsiding gradually. Chills and high temperature (101 to 105° F) then developed, the wound was explored and a larger drainage-tube inserted, with the hope that better drainage would have a favorable effect on the temperature. This result, however was not obtained although the chills became less frequent. One week after operation a blood examination of 3,530,000 R. B. C., 21,500 W. B. C., 55 per cent. Hb. indicated developing sec-

diarrhea and general dyspeptic symptoms are also mentioned as occasional symptoms. Distention while rarely due to obstruction, is noted in many of the cases.

Variety.—When the type of cell was described fully 10 were found to be round-cell sarcoma, 9 lymphosarcoma and 1 was of the spindle-cell variety. In 99 cases of sarcoma of the small intestine which I analyzed some years ago 34 were lymphosarcoma, 43 round-cell, 13 spindle-cell 3 fibrosarcoma, 1 mixed-cell sarcoma 2 myxosarcoma 2 myosarcoma 1 melanotic sarcoma.

This instance of hemangio-endothelioma arising in the large intestine so far as I am able to ascertain, is altogether unique. Ewing states that this term has a very limited application and includes only certain rare tumors arising in the corpus caver nolum the multiple endothelioma of bones thyroid, probably the ovary skin and an intravascular endothelioma arising in hemorrhoidal or other dilated veins.

The recent literature contains but few reports on the subject of hemangio-endothelioma, and those which I have casually looked up have been tumors of the gastro-intestinal tract. Dr John H. Jopson recently in this hospital operated on a growth of this nature arising in the spleen. Foote has collected 10 cases of what he terms hemangio-endothelio-sarcoma of the liver a disease seen in the early months of life, and having no tendency to metastasize. Carman has reported a benign hemangioma of the duodenum a growth sessile in character but filling the lumen of the gut and easily removed by a transverse incision of the duodenum. Boggs and Winternitz also record a case of multiple subcutaneous hemangio-endothelioma and multiple tumors of the same type occurring throughout the alimentary tract, esophagus, stomach large and small intestine.

The report of the autopsy and description of the specimen made by Dr John Eiman, pathologist of the hospital is appended.

Emaciated white boy about seventeen years old. Slight edema around ankles. Recent left rectus incision well healed everywhere except the upper end, where there is an opening of

whose summary while not the most recent, gives the salient features of the disease.

**Sarcoma** may be found in both the large and small intestine, although the disease is much more frequent in the latter. In analyzing the cases found in the large bowel the age incidence varies considerably 7 were under ten years, certainly 2 or probably 3 between ten and twenty years, in a series of 22 cases, showing that there is a marked predisposition in early life.

**Location.**—In 14 of the 22 cases the large bowel alone was the seat of the sarcoma, being distributed as follows: cecum 7 cecum and ileum 5 cecum and ascending colon 3 transverse colon 4 descending colon 1 sigmoid flexure 2

**Metastasis.**—The abdominal lymphatics are by far the most common sites for the deposit of metastatic growths, with the peritoneum next in point of frequency. Except where the peritoneum is involved by continuity the dissemination takes place through the mesentery explaining the frequent and early involvement in the cases coming to operation or autopsy.

**Origin of Tumors.**—The mucosa or submucosa seems to be the starting-point in most cases the remaining coats of the bowel gradually becoming involved. Although partial occlusion of the bowel is present in about one-half of the cases complete stenosis rarely develops from the mere presence of the sarcoma. Even in large tumors encroaching on the intestinal lumen a narrow passageway can be demonstrated, thus explaining the chronic intermittent symptoms of intestinal obstruction, or the almost complete absence of such symptoms.

**Symptomatology.**—The rapid course of the disease is responsible for the symptoms of loss of weight, emaciation, and weakness, early and prominent symptoms in most cases. Fever is frequently noted, and is moderate unless septic infection and peritonitis develop. Ascites has been noted very uncommonly.

Symptoms referable to the gastro-intestinal tract were present in about 65 per cent. of the cases, were mainly pain, anorexia and vomiting. Pain is probably always present and has been the first symptom noted in several cases. It is severe periodic in some, acute in some and colicky in others. Bloody stools

from the other abdominal organs. The omentum and rather recent inflammatory adhesions surround the fistulous tract which leads to a small opening in the small intestine. There are no communications between the fistula and the lumen of the large intestine.

In the wall of the splenic flexure of the colon there is an irregular mass measuring roughly 11 x 5 x 5 cm (Fig 112). The

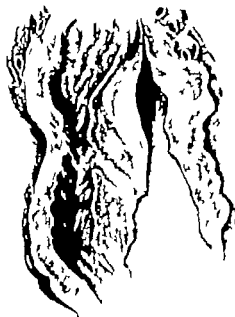


Fig. 113.—Cross-section of tumor

serous coat of the colon in this region shows numerous dilated varicose veins some of which measure 4 mm. in diameter. The tumor involves all of the coats of the intestine, so that the thickness of the wall at some points measures 20 mm. There is no evidence of encapsulation although the growth is rather sharply limited above and below. The mucosa shows irregular fairly deep ulcerations with necrotic bases and edges for 9 cm. The



a *fastulous* tract through which exude small amounts of fecal material. Abdomen is slightly rounded, wall very thin. Peritoneal cavity contains 200 c.c. of clear straw-colored fluid.



Fig. 112.—Hemangio-endothelioma of splenic flexure.

Most of the omentum is found in the left upper quadrant, where there are fairly dense fibrous adhesions between the omentum and parietal peritoneum just above the splenic flexure of the colon, forming a fairly complete wall and isolating the spleen

the lateral aspect and descending colon there is an irregular cavity which begins at the upper pole of the kidney and extends down to a point 4 cm. below the anterior superior spine. This pocket varies in diameter from 1.5 to 4 cm. is situated extra

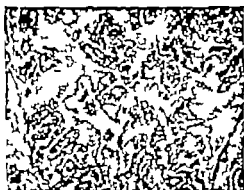


Fig. 116 —Blood spaces in subserous coat, low power

peritoneally and contains foul-smelling purulent material. This is apparently secondary to the ulcerative process in the colon.

The small intestines show no gross lesions. The appendix has been removed



Fig. 117 —Infiltration of muscle coats.

The liver is 1640 gm. 20 x 23 x 9 cm. capsule not thickened. There are seen bulging from underneath the capsule *numerous* abscesses. On section, the liver is honeycombed with branching abscesses which vary in diameter from few millimeters to 4 cm.

tumor cuts with increased resistance. The cross-section of the wall is mottled, grayish to reddish-gray in color firm in consistency and shows numerous large blood-vessels in the subserous and what appears to be the outer muscular coats. The lumen of



Fig. 114.—Large vein in subserous coat.

the intestine is markedly narrowed and barely admits a lead pencil (Fig. 113). The wall of the colon and the mucosa above and

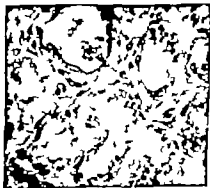


Fig. 115.—Blood spaces in subserous coat, high power

below the tumor mass shows no lesions. There are no evidences of secondary tumor growth elsewhere.

Between the antero-internal aspect of the left kidney and

## HOUR-GLASS STOMACH; GASTROGASTROSTOMY

THIS patient, a greatly emaciated woman, forty-four years of age has suffered for years with gastric trouble. She has consulted various physicians, but treatment has been without symptomatic relief. She states that seventeen years ago she was burned severely about the neck and chest, and that the stomach trouble began shortly thereafter. As a result of the chronic gastric disorder she always has been thin, but within the past two months has lost 25 pounds in weight.

In July 1920 she had an attack of severe pain in the epigastrium, the pain radiating toward the back. Following this attack there was much eructation of gas and frequent vomiting at irregular intervals, not dependent on the taking of food. There has been no blood in the vomitus, but blood was noted in the stools on a few occasions.

Her last physician, after a short course of medical treatment had the gastro-intestinal tract studied by x ray and a diagnosis of hour-glass stomach was made (Fig 118). The patient was then sent to the hospital for operation, which at the time of admission, September 22 1920 was imperative on account of the greatly weakened condition.

Operation.—The stomach was exposed by a midline incision and the condition disclosed by the x-ray was corroborated on examination of the viscus. There was an old healed ulcer along the lesser curvature at the upper end of the constriction which was responsible for the deformity which resulted in two pouches of equal caliber. At the pylorus a very small, apparently healed ulcer was noted, this did not cause stenosis. A gastrogastrostomy with clamps seemed to be the quickest means of relieving the condition, as any prolongation of operative procedures would have been extremely hazardous, and a large opening between the two pouches was made. The appendix, the seat of chronic inflammation, was removed.

Most of these cavities have fairly thick, jagged walls. They contain thin purulent material. The spleen is 180 gm. 13.5 x 9 x 3.3 cm. capsule smooth, tense section purplish. Neither follicles nor trabeculae very distinct. Pulp fairly firm. No noteworthy lesions.

*Microscopic* Tumor: Splenic flexure of colon.

Serous coat thickened. In the subserosa are seen numerous large veins with irregularly thickened walls and irregular spaces lined with endothelial cells and filled with blood. Underneath these blood spaces are seen groups of microscopic blood-vessels and irregular spaces lined with fusiform and cuboidal endothelial cells. These spaces are separated by connective-tissue stroma showing diffuse infiltration of cells similar to those lining the blood spaces.

The muscularis, submucosa and mucosa show infiltration of endothelial cells and diffuse scattered groups of microscopic blood spaces. The mucosa and, in places, the submucosa are ulcerated and gangrenous.

*Summary*—Primary hemangiomatous endothelioma of splenic flexure of colon leading to ulceration and secondary retroperitoneal abscess formation and partial obstruction.

Fecal fistula—small intestine.

Thrombopyophlebitic lacunae of liver

No evidence of metastases.

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tween the two pouches, and no tendency toward the constriction as seen in the first picture. At this time and subsequently the patient has remained well and shows a continued and gratifying gain in weight and strength. She suffers distress only when she is indelicate in her diet. A study of the gastric chemistry was inadvisable before operation and was refused by the patient at a later period.

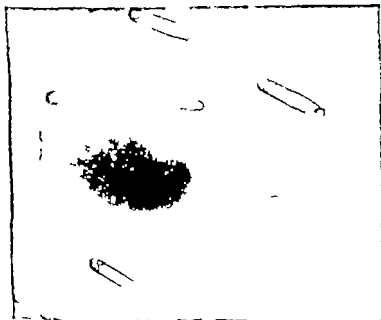


Fig. 119.—Hour-glass stomach after gastrogastrostomy

**Discussion.**—The etiologic significance of the burn followed by gastric disturbance is an interesting feature in this case. That severe burns are followed by ulcer formation in the duodenum is well known. That the same condition may arise in the stomach seems beyond dispute as such ulcers must be regarded as the result of toxemia following septic infection of the burned areas. It has been stated that the so-called Curling's ulcer of

**Postoperative Course.**—The patient stood the operation well and was in surprisingly good condition the following day. At no time was there any nausea or vomiting. On the fourth day the stools contained some dark blood and thereafter were normal. For the first twenty-four hours nothing was given by mouth, enteroclysis supplying sufficient fluid. After the first twenty-four hours small amounts of water and other fluids were given, and



Fig 118.—Hour-glass stomach.

increased gradually until the fourth day when the patient complained of hunger and requested a more liberal diet, which when given, caused no distress. Her convalescence was unattended by any untoward symptoms, and when discharged from the hospital October 9 1920 she was much stronger and was able to digest and assimilate a varied and liberal diet. (An x ray) (Fig 119) taken one month after the operation shows a wide opening be-

curve with many years history of a continuous or intermittent type. Many ulcers had completely healed, leaving a hard scar which in the process of years had drawn to itself the adjacent areas of gastric wall so as to produce the contraction. Many had unhealed ulcers, some with extensive adhesions to liver pancreas, and even the anterior abdominal wall. In view of the current opinion that malignant disease of the stomach is grafted on a chronic ulcer foundation, the series of 50 without a single malignant case does not support it, although the disease had lasted many years in some patients.

Thomas believes no set operation can be advocated for this condition the operative procedures can only be determined after the abdomen is opened and the stomach carefully examined. In the series he employed gastropasty combined with posterior gastro-enterostomy to the distal pouch on account of pyloric constriction. Gastrogastrostomy was satisfactory in 15 cases of large pouches with a narrow and fibrous constriction.

Posterior gastro-enterostomy performed on the proximal pouch was done in 14 cases, when the sac was small and high up.

When the pouches were equal in size and the constriction extensive, with pyloric stenosis in addition, double posterior gastro-enterostomy was done in 2 cases.

In complicated cases, which were few in number anterior gastro-enterostomy gastroduodenostomy combined anterior and posterior gastro-enterostomy and partial gastrectomy were necessary. These various types of operation show the necessity for thorough examination to meet the conditions arising in this very serious deforming condition.

The end results indicate that no particular type of operation had much to do with the final outcome provided a free flow had been established from the stomach. The majority of patients were entirely relieved and the recoveries astonishing in a great many almost hopeless cases in persons reduced to extreme emaciation through long years of suffering.



the duodenum does not occur unless septic infection of the burn takes place.

The choice of operation is a matter dependent upon the pathology found and to a certain extent, upon the condition of the patient. Gastrogastrostomy with pouches of equal size, presented an easier and quicker operation and perhaps attended with less shock, an important consideration in this case on account of the state of marked malnutrition. Fortunately the pyloric ulcer seemed to be healed and did not cause stenosis, otherwise a posterior gastro-enterostomy to the distal pouch would have been necessary. Even this additional procedure seemed inexpedient in this case and was reserved for a secondary operation if symptoms of pyloric stenosis developed. The improvement up to fifteen months after operation, however has been such that further operation has not been deemed necessary and would seem to corroborate our judgment in meeting the indications only in this case. We are aware, of course, of the danger of pyloric ulcer particularly as to the development of malignancy and have advised careful observation of the patient supervision of diet, etc., by her family physician. In order to ascertain the appearance of any future trouble in its early stages.

In studying the notes of 50 consecutive cases of hour-glass stomach subjected to operation Thomas (British Journal of Surgery 1921 ix, 37) makes a number of observations which are most interesting and instructive and to which I think we can allude with profit.

He found that only 4 of his cases occurred in women. The most noted feature was the long duration of symptoms before surgical and had been resorted to with the exception of 3 patients whose symptoms had lasted only one, two and three years respectively. All the others had complained of gastric trouble for periods varying from five to thirty years the average being nine years and most of the sufferers had been under medical treatment intermittently throughout.

The acute hemorrhagic variety of gastric ulcer rarely leads to this deformity but rather the chronic ulcer on the lesser

## BLOOD TRANSFUSION IN A CASE OF SECONDARY ANEMIA ASSOCIATED WITH FIBROMA OF THE UTERUS AND SEPSIS

THE patient is shown to demonstrate the prompt and beneficial result of transfusion in a case of secondary anemia resulting from menorrhagia due to a fibroid tumor of the uterus and low-grade pelvic infection following the application of radium.

I shall briefly allude to the gynecologic condition for which the patient entered the hospital December 9 1920. She is forty-one years of age married and the mother of 3 children. Her chief complaint is menorrhagia which has been almost continuous for the past five weeks.

Examination showed a fibroid uterus, and for this condition radium was applied on December 31st. Following the application the patient had a severe reaction her temperature was elevated and ranged from 100° to 102° F for a period of four weeks. In addition to this there was generalized pelvic tenderness on vaginal examination. The tenderness gradually disappeared, but there still persisted until February 20 1921 a daily elevation of temperature, 99° to 100° F. The patient feels rather weak, slight exertion out of bed causing exacerbations of pain. Blood examination, February 1 1921 3,000,000 red blood-cells, hemoglobin 46 per cent. there has been no response to hypodermic injections of iron, although the menorrhagia has ceased.

Transfusion of 500 c.c. of blood was given on February 26th, the citrate method being used. This was followed by a slight reaction. The blood count the following day was 4,080,000 red blood-cells 60 per cent. hemoglobin and 8250 white blood-cells. There was a very marked improvement in the general condition which manifested itself three days after transfusion. The abdominal pain was slight and the patient felt decidedly better. The appetite improved and she was able to be out of bed a week later without the feeling of lassitude which was



## BLOOD TRANSFUSION IN A CASE OF SECONDARY ANEMIA ASSOCIATED WITH FIBROMA OF THE UTERUS AND SEPSIS

THE patient is shown to demonstrate the prompt and beneficial result of transfusion in a case of secondary anemia resulting from menorrhagia due to a fibroid tumor of the uterus, and low-grade pelvic infection following the application of radium.

I shall briefly allude to the gynecologic condition for which the patient entered the hospital December 9 1920. She is forty-one years of age married and the mother of 3 children. Her chief complaint is menorrhagia, which has been almost continuous for the past five weeks.

Examination showed a fibroid uterus, and for this condition radium was applied on December 31st. Following the application the patient had a severe reaction, her temperature was elevated and ranged from 100° to 102° F for a period of four weeks. In addition to this there was generalized pelvic tenderness on vaginal examination. The tenderness gradually disappeared, but there still persisted until February 20 1921 a daily elevation of temperature 99° to 100° F. The patient feels rather weak, slight exertion out of bed causing exacerbations of pain. Blood examination, February 1 1921 3,000,000 red blood-cells, hemoglobin 46 per cent. there has been no response to hypodermic injections of iron, although the menorrhagia has ceased.

Transfusion of 500 c.c. of blood was given on February 26th the citrate method being used. This was followed by a slight reaction. The blood count the following day was 4,080,000 red blood-cells 60 per cent. hemoglobin, and 8250 white blood cells. There was a very marked improvement in the general condition which manifested itself three days after transfusion. The abdominal pain was slight and the patient felt decidedly better. The appetite improved and she was able to be out of bed a week later without the feeling of lassitude which was

present previously. Two weeks after the transfusion, when she was discharged from the hospital, the blood count showed 4,250,000 red blood-cells and 75 per cent. hemoglobin. The patient's condition was quite satisfactory in that she could be up and about without discomfort or becoming tired. The fever which had persisted for a period of six weeks, became normal one week after the transfusion and has so remained.

**Discussion.**—The case is shown with the idea of demonstrating the beneficial effects of transfusion for a condition of low-grade infection and secondary anemia. The pelvic peritonitis in this instance was undoubtedly lighted up by the application of radium. The anemia was secondary to the fibroid uterus and its resulting menorrhagia.

The indications for transfusion are now well established, the various methods used are perfected from the technical point of view until the operation is attended with little or no danger. It seems to me that in conditions of low-grade sepsis and the secondary anemia following transfusion has not been used as generally as its beneficial results warrant. This has been so in my own practice and I find that transfusion before and after operation in many cases of this type have produced results which lead me to employ transfusion more and more frequently.

**Choice of Method.**—You are familiar with the controversy being waged at present between whole blood transfusion and the citrate method. I believe both methods have their use and that the surgeon must decide in each case whether there is any contraindication to the use of the citrate method. As experience has been gained in transfusion we have found that certain advanced forms of anemia or other blood dyscrasias with an extremely low blood count give marked reaction to the introduction of citrate and in such cases we prefer direct transfusion. In the acute anemias following hemorrhage and in the secondary anemias of mild degree with or without sepsis the citrate method has been perfectly satisfactory and has not resulted in any harmful reactions. It must be admitted, however in our own practice the tendency is to do fewer transfusions by the citrate method and to utilize direct transfusion by the Linger method which we prefer.

## CLINIC OF DR. DAMON B. PFEIFFER

### PRESBYTERIAN HOSPITAL

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#### SUBPECTORAL ABSCESS

THE patient is a colored man, twenty nine years of age. Three weeks ago he received a slight laceration on the dorsum of the left ring finger. A scab formed on the wound and the patient forgot about it until one week ago when he began to feel pain running up his arm and noticed some tenderness and swelling in his left breast. He picked off the scab and found a little pus under it. For a day or so he felt better then he was seized with severe pains under the left breast and arm. At times he would feel chilly and at night he had drenching sweats.

On admission to the Presbyterian Hospital in the service of Dr. John H. Jopson any attempt to move the left arm was very painful. The entire upper left pectoral region bulged and was tender no fluctuation could be detected. The axilla was not affected except for edema of the superficial tissues, which was marked along the entire lateral border of the pectoralis major. The night before operation the temperature reached 103.4 F and the patient gave the impression of severe toxemia.

Under gas and oxygen anesthesia an incision was made just external to the margin of the pectoralis major evacuating an abscess situated in the subpectoral space. The pus was creamy in appearance and consistency and about 150 c.c. in amount. Here also was a mass of inflammatory tissue evidently consisting of fused lymph-nodes and infiltrated cellular tissue. A portion of this was excised. Coagling was free. The cavity was packed with plain gauze for hemostasis and drainage. Beginning on the third day the packing was removed piecemeal being all out on the sixth day. The Carrel-Dakin treatment of the infected

cavity was instituted. The general condition of the patient had responded at once, and on the seventh day after operation the temperature became normal and remained so. The subpectoral cavity rapidly became obliterated by granulation and cohesion leaving a rather deep superficial wound. Two weeks after operation the bacterial count of the smear from the wound discharge showed only 2 cocci to 50 oil-immersion fields and cultures yielded a few scattered colonies of staphylococci. Under

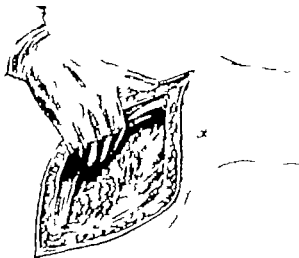


Fig. 120—Showing incision employed to evacuate subpectoral breast. The lower end as prolonged to the border of the latissimus because of the extreme adhesion and swelling in this region. Note vena unaffected.

gas and oxygen anesthesia again the skin edges were pared and the wound surfaces opposed by on-end mattress sutures of silk worm-gut the deep portion of the suture entirely encircling the wound, the superficial or returning loop merely catching the lips of the wound to insure skin approximation. There was some discharge of wound secretion, but never any local or general evidences of infection, and in ten days the wound was solidly healed.

The pus yielded a pure culture of *Streptococcus hemolyticus*. I recall vividly three other cases of subpectoral abscess seen



Fig. 121—Wound after sterilization of cavity and partial obliteration  
Depth 1 to 2 inches

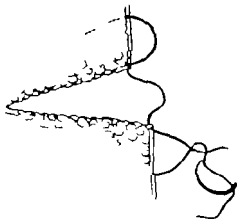


Fig. 122—Showing gauze adapted to accurate position of deeper structures and skin edges in gaping wounds of irregular contour

within the last three years. A farmer aged fifty-four cut his middle and little fingers slightly on hot-bed sash. He paid



little attention to the wounds, which were not deep, and three days later he plowed and spread manure. Two days after this he felt pain in his left chest. There was no pain in the arm and the hand seemed to have healed. The next day he called his physician, Dr. Crowe, who found his temperature 104 F. The left pectoral region was swollen and tender and so painful was motion of the arm that the condition simulated paralysis. The patient refused to go to a hospital and was kept under observation for eleven days at his home. Fortunately he did not become septic and his general condition actually improved. When I saw him and operated at this time, the subpectoral space was a huge abscess cavity. The axilla had become involved secondarily. The skin was thin, red, and fluctuating at several points over the sternal attachments of the pectoralis major. The abscess was freely incised at the lateral margin of the pectoralis and through-and-through tube drainage carried to the medial and superior aspects of the muscle. Recovery with full function took place in four months. Culture showed the streptococcus.

A second case concerned a woman of fifty-five years of age who picked her finger with a safety-pin while minding a child sick with scarlet fever. There was no local reaction so far as she could recall, nor did the arm swell but on the fourth day she began to have pain in the pectoral region on the same side, and rapidly developed a huge painful swelling beneath the pectoralis major. Systemic symptoms were severe. The abscess was opened four days later by free incision along the outer margin of the muscle, and amelioration of symptoms and recovery rapidly took place. The infecting organism was the streptococcus.

The remaining case was that of a man twenty-three years of age, whose history and condition were more difficult to interpret. Several months previously while in the army he had received antityphoid inoculations in the left arm. He felt sick and the arm was sore but this passed off. Three weeks later a small abscess (from his description apparently a furuncle or pustule of the skin) appeared in the axilla and was opened healing taking place promptly and without incident. Some

weeks after this he noticed a slight soreness in the left pectoral region and thought it was a little swollen. About this time he was mustered out, and being anxious to take up his civilian work he did no more than mention the condition to the examiner who after a brief examination attached no importance to it. However after his discharge the swelling and discomfort increased. He consulted his physician, who sent him to an eminent surgeon. The latter diagnosed cold abscess and advised a small incision at the outer border of the pectoralis, which was done by the physician, evacuating a considerable amount of rather thin yellowish pus. The swelling diminished greatly but discharge continued. I saw him six weeks later and found that there was a large slough in the cavity which interfered materially with drainage. This was removed, and in the course of a few weeks the sinus closed. However within a month two small subcutaneous abscesses appeared at the sternal margin just below the sternal clavicular border and a few days later there was a rapid reappearance of the subpectoral collection. Under general anesthesia the abscess was evacuated and found to run beneath the muscle to the site of the two small subcutaneous abscesses. Incision here showed small sinuses penetrating the intercostal muscles in the first and second interspaces. It was clear that there was retrosternal suppuration. The sternal end of the second cartilage was removed and a cavity filled with soft granulation tissue was curetted and packed. The subpectoral abscess now closed and remained so but in order to complete the cure it was necessary later to remove the central portion of the sternum almost to the ensiform in order to uncover a suppurating sinus which lay in the anterior mediastinum immediately behind the sternum. After this was done healing was rapid and complete. Bacteriologic investigation of this case was inconclusive because the abscess had been opened several weeks before coming under my observation. At different times the streptococcus and Staphylococcus albus and aureus were recovered. The slow development of the condition and relatively afebrile course suggested a tuberculous condition but guinea pig inoculations were negative and x ray study of the chest showed no recognizable tuberculous process.

Almost nothing has been written within the last few years concerning subpectoral abscess, and few text-books or systems of surgery even mention the condition. Riesman in 1915 (*N Y Med. Jour.*, *ci*, 658-660) reports 2 cases and calls attention to the sudden onset and severity of the condition. In 1900 Musser (*Amer Jour Med. Sci.* November 1900) reported 3 cases and collected 23 from the literature which did not, however include all the cases previously reported. Most of the cases were from French sources, and in the days before early and thorough surgery was the rule the mortality was high. Musser notes the two clinical variations (1) the acute or phlegmonous (2) chronic or cold abscess. In some cases traumatism appears to play a part, and it is probable that a subpectoral hematoma may at times be infected by way of the blood-stream. In the vast majority of instances the infection reaches the subpectoral space through the lymphatics from a focus situated either superficially or deeply anywhere within the lymphatic drainage area. It is evident that some of the cases reported in the literature are instances of empyema necessitatis. Musser was impressed with the frequency of transmission of infection from the pleura either by extension with evident gross venues of communication or by lymphatic transmission without such evidence. One case reported showed a connection with an abscess of the anterior mediastinum very similar to that reported herewith. More accurate means of diagnosis and earlier resort to surgery has greatly diminished the cases falling into this group. Nowadays the condition is most often due to lymphatic metastasis from the upper extremity or occasionally from the tissues of the shoulder or breast. Although not common the condition is important because of its dangerous nature, and the fact that its unusual location tends to delay recognition and appropriate treatment. While the termination in the cases here reported was fortunate this is by no means the invariable rule, and the danger in at least two of these cases was greatly increased by delay in resorting to free incision into the infected area.

There is described an interpectoral group of lymph-glands

lying beneath the lower border of the pectoralis major anterior to the long thoracic artery at the level of the second and third intercostal spaces. Below this level in the fourth and fifth intercostal spaces in relation to the long thoracic artery are sometimes found several small nodes known as the infero-pectoral group. It is easy to see that infections derived from the thoracic cavity or deeper structures of the adjoining chest wall would be likely to localize in these deep nodes. Of course intrathoracic infection rarely penetrates the parietes, the pleura usually constituting an impassable barrier just as the parietal peritoneum confines its contained infective processes until actual ulceration affords an outlet. On the other hand, it is a matter of every-day observation that lymphatic infections of the upper extremity are arrested at least temporarily by the axillary nodes. It seems probable in the case of subpectoral abscess evidently derived from a primary focus on the upper extremity without involvement of the axilla that an anatomic abnormality of the lymphatics exists comparable to the frequently observed abnormalities of the blood vascular system. Such an arrangement is difficult to demonstrate but it is also difficult to account for the phenomenon on any other basis. More attention is now being given to the rôle of the lymphatics in the propagation of infection, especially in connection with the etiology of such conditions as cholecystitis and pancreatitis and a more accurate knowledge of the constitution and behavior of these structures in infection is destined to influence greatly our ideas of the pathogenesis of many infective disorders.

The treatment of subpectoral abscess is summed up in early and efficient drainage and the employment of our modern resources in the handling of infection as illustrated by the first case



## CLINIC OF DR. P. G. SKILLERN, JR.

### MEDICO-CHIRURGICAL HOSPITAL

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## SURGICAL LESIONS OF THE ULNAR NERVE AT THE ELBOW

**Summary.** Superficial Position of Ulnar Nerve at Elbow Exposes it to Trauma; Direct or Indirect. Illustrative Cases. Variety of Causative Trauma; Mouchet's Syndrome. Diagnosis. Symptoms and Signs in Detail Illustrating the Dissociated Syndrome; the Law of *Contracture d'aspect*. Variations in Course and Distribution of Ulnar Nerve that Might Mislead "Progressive Ulnar Paralysis." Treatment Should Be Operative: the Four Methods of Operation; Rapidity of Postoperative Restoration of Function. Bibliography.

UNLIKE other nerves of the body—with the exception of the external popliteal where it winds around the neck of the fibula—the ulnar nerve in its groove behind the internal epicondyle is peculiarly exposed to trauma direct or indirect, which usually soon or late gives rise to sensory and motor disturbances in the ulnar territory of the hand whose etiology—especially in the indirect trauma—is often at first glance obscure.

**Case I. Elbow Fracture Followed by Compression Neuritis of Ulnar Nerve.**—O. R. male aged forty-two steamfitter on December 15, 1919 fell in shipyard a distance of 28 feet, landing on palm of right hand, spraining wrist and shoulder and injuring right elbow. He was taken to a hospital where, four days later the fractured head of the right radius was resected. We first saw him about a year (December 29, 1920) after the accident, at which time he stated that there was no strength in the right elbow that it was very painful and that he could not bend it on account of the pain.

**Physical Examination** (December 29, 1920).—Little and ring fingers of right hand are cold; there is diminished sensation in

these fingers there is slight atrophy of the hypothenar eminence. Our attention now being directed to the elbow we found there exquisite tenderness along the ulnar nerve in its course in the olecrano-epicondylar groove, with definite filling-in of the latter. The joint motions *per se* were good, but the slightest degree of



Fig. 121.—Filling in of groove for ulnar nerve from traumatic osteo-arthritis following fracture of head of radius.

flexion caused intense pain in the ulnar nerve. Skiagram (Fig. 123) reveals traumatic osteo-arthritis, with filling-in of the olecrano-epitrochlear groove. There is, too, crepitation on movement of the joint.

The diagnosis was immediately made of compression neuritis

of the ulnar nerve following elbow injury the patient was advised to submit to operation, the purpose of which would be to release the nerve from the pressure in its groove and transfer it to a position before the internal epicondyle a good prognosis

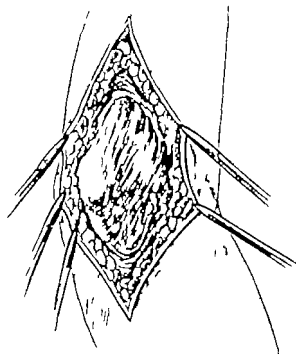


Fig 124—Ulnar nerve compressed by fibrous band, against which it was pushed by proliferation from the underlying bone.

as to the relief from pain and as to recovery of function of the ulnar nerve was given.

*Operation* (January 10 1921)—Local anesthesia. Incision along course of ulnar nerve in the olecrano-epitrochlear groove. Ulnar nerve exposed and found compressed by a fibrous band (Fig 124) against which it was pushed by proliferation from the underlying bone. The nerve was released and transferred



to a position before the internal epicondyle where it was placed upon the deep brachial fascia and retained by suturing the divided superficial fascia over it (Fig. 125). Immediately the patient could flex his forearm 2 inches more than before operation, and with much less pain. Dry dressing applied, wrist put in sling.

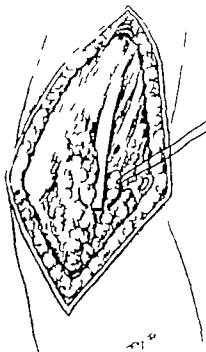


Fig. 125—Ulnar nerve transposed to front of elbow, placed upon deep fascia, and retained by suturing divided superficial fascia over it.

*Postoperative Notes* (January 11th)—Patient states that pain in elbow disappeared *immediately* after operation and that for the first time since the injury he could touch his forehead with the fingers. The little and ring fingers, however, are still numb.

January 20th—Stitches removed healing *per primam* throughout.

March 11th (two months after operation) Tenderness over ulnar nerve is no longer present. The numbness is now confined to the finger tips, which are "sore." With the arm abducted the patient is now able to touch the top of his head. Rotation of the radius is increased in range. The patient feels that the electricity and baking are doing him good. Insomnia has wholly disappeared.

June 17th (about five months after operation) The ulnar nerve where transposed is palpable and freely movable from side to side beneath skin and fat, showing its complete freedom from tendon. In the little finger epicritic sensation is absent, but protopathic is present. Skiagram reveals bone proliferation about olecranon and coronoid apparently limiting flexion to just beyond a right angle. Girth of arm  $1\frac{1}{2}$  inches less than on sound side girth of forearm  $\frac{1}{2}$  inch less.

October 10th (nine months after operation) Patient feels he is improving so rapidly that he will be able to resume his trade of steamfitter early in the new year. (This would be about one year after the operation, which is approximately the time nerve function is fully restored after operation in the average case.)

Case II. Elbow Laceration Followed by Compression Neuritis of Ulnar Nerve—W. A. male, aged sixteen, cord worker while at work in the cording room suffered laceration of the right elbow on June 2, 1918 the wound was treated by a bandage alone. The patient states that directly after the injury the little and ring fingers felt numb and that he was unable to extend these fingers. When first seen by us (April 8 1919) about ten months after the accident, the patient complained of partial anesthesia of right hand with partial loss of power in same and stated that there has been no improvement since the time of the accident.

Physical Examination (April 8 1919)—Analgesia of little finger ulnar side of ring finger and adjacent palmar and dorsal aspects of right hand. Proximal phalanx of little finger hyperextended, that of ring finger to less extent middle and distal

phalanges of same fingers flexed. Hypothenar eminence and dorsal interosseous spaces—including adductors of thumb—withered. Examination of the right elbow shows an irregularly circular cicatrix of skin between olecranon tip and internal epicondyle, and over the point of the elbow a small skin ulcer the size of the little finger-nail. There is no sign of bone injury or callus.

The diagnosis was made of cicatricial compression neuritis of the ulnar nerve, due to an old lacerated wound of the elbow. Operation was advised and prognosis was made as in Case I.

*Operation* (April 9 1919).—*Local anesthesia.* Semilunar incision—convex outward—made over internal condyle anteriorly 4 inches in length. This incision passed through healthy skin anterior to scar-tissue area; below it terminated opposite lower crease of elbow. Incision divided skin and half of thickness of fat beneath skin, the deep portion of fat being allowed to remain attached to deep fascia covering origins of flexor muscles of forearm. Flap elevated and turned inward exposing internal epicondyle, olecranon and ulnar nerve groove between. Cicatricial tissue was found binding nerve down in its groove. Just above the cicatricial area—i. e. just above the internal epicondyle—the ulnar nerve was the seat of a spindle-shaped neuroma, which was enclosed in a definite capsule. The nerve was freed at upper angle of wound by dividing neuroma capsule and freeing latter and also at lower angle, where it disappears between heads of flexor carpi ulnaris; between these two points the nerve was released from compressing scar tissue. The nerve had apparently not been divided at the time of the injury but when released seemed to be in continuity as normal nerve-fiber tissue—although of lessened diameter—except at site of neuroma. The nerve was drawn forward without tension to before the internal condyle. The deep layer of fat was now reflected from this area, beginning at the border of the condyle; the nerve was then sandwiched between this fat layer and the deep fascia; the fat layer was tacked down in place again around the margin of the internal condyle using interrupted sutures of No. 00 plain gut. Skin edges approximated by continuous fine silk.

worm-gut suture. No drainage. Dry gauze dressing. Wrist suspended in sling.

*Postoperative Note*—The very next day after operation the patient stated that feeling was returning to the ulnar side of the ring finger and as time went on not only were epicritic and protopathic sensations completely restored but power gradually returned to the small muscles of the hand supplied by the ulnar nerve.

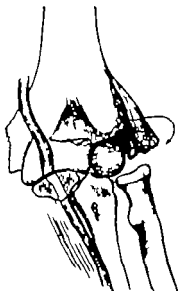


Fig. 126.—Ulnar nerve displaced anteriorly and compressed against trochlea by fragment from internal epicondyle (Payr)

There is a large variety of traumata that may eventuate in surgical neuritis of the ulnar nerve. The presence of a supracondylar process may sufficiently irritate the nerve to produce symptoms and signs. The occasional receipt of a simple direct contusion of the nerve has led the laity to coin the term *crazy bone* but the effect of a contusion or sprain may be more serious by leading to the formation of an arthropathy through the sequence of hematoma and osteophyte production. The nerve in its groove may be subjected to scar tension following a

burn, laceration, etc. and a scar may even lift the nerve out of its groove. Fracture of almost any portion of the elbow may affect the nerve directly or indirectly. Thus, Pavr reports a fracture of the internal epicondyle with displacement of the fragment to the anterior surface of the trochlea, the fragment



Fig. 127

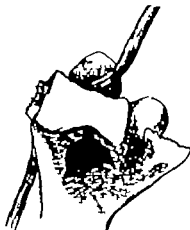


Fig. 128

Figs. 127-128—Same as Fig. 126, viewed from below and behind (Pa.)

carrying with it the ulnar nerve and compressing it upon the trochlea (Figs. 126-128). If the fragment is not displaced fracture of the internal epicondyle may eventuate in ulnar neuritis in the same way a contusion does by scar tissue or callous formation. Fracture of the external condyle (usually in

infancy) resulting in cubitus valgus and this in turn eventually in ulnar neuritis from stretching of the ulnar nerve is the mechanism described by Mouchet in 7 cases (Fig. 129) although the neuritis usually manifested itself long after the injury—twenty and even fifty years. (Cf. cervical ribs.) Diacondylar fracture of the humerus, epiphyseal separation of the lower end of the latter fracture of the olecranon, and luxation of the elbow have



Fig. 129—Diagram showing the tension of the ulnar nerve upon the internal border of the olecranon in the deformity of cubitus valgus following fracture of the external condyle (Mouchet).

all been reported as causes of surgical ulnar neuritis as have deformities following infectious arthritis. The writer recalls the case of a locomotive engineer who developed a mild ulnar neuritis from leaning upon the right elbow while at his post of duty. And finally there are the direct injuries such as incised stab and gunshot wounds involving the nerve at the bend of the elbow.

The diagnosis of surgical neuritis of the ulnar nerve due to one of the above-mentioned lesions at the elbow will probably be made in most cases by working from effect to cause. *i. e.* attention will be attracted by the more or less well-developed *griffe* and then physical and x-ray examinations of the elbow will be made for a scar or bony lesion. The examiner must bear in mind however the traumatic neuritis of the ulnar nerve in the hand resulting from repeated contusions to the hypothenar eminence, such as occurs in industrial workers (carpenters, dyers, calico printers, shoemakers, etc.) cervical rib neuritis disease of the central nervous system and the occasional selective localization in the ulnar nerve of chronic alcoholism, chronic lead-poisoning, and infectious diseases, such as variola.

The symptoms and signs may be few and mild, especially in the early stage or there may be a well-marked *griffe* with trophic disturbances. Studies of the ulnar symptom-complex made upon soldiers injured in the World War have shed much light upon this subject let us select one of these studies and see if it does not facilitate an understanding of this complex.

Déjerne and Mouzon presented before the June 3, 1915 meeting of the Société de Neurologie of Paris a report upon 2 patients who were afflicted with partial lesions of the ulnar nerve from injury of the nerve just above the ulnar groove. In the first there was involvement of the inner part of the nerve. In the second compression of the outer surface at the same level. Reference to the accompanying excellent diagrams will show at a glance the different effects of these dissociated lesions (Figs. 130-131). The heavy shading indicates complete loss of sensation or of muscle power while partial less conspicuous losses are shown by lighter shading and tipping.

CASE I.—Dissociated paralysis of the ulnar nerve from bullet interruption of the inner third of the nerve just above the ulnar groove. Predominance of disturbances in the sensory fibers—cutaneous (Fig. 130 *d*) osseous (Fig. 130 *e*) articular (Fig. 130, *f*)—in the hypothenar eminence (Fig. 130 *c*) and in the intermet of the last spaces. Slight *griffe cubitale* (Fig. 130 *a, b*). Operation revealed defect in the inner third of the cross-section of the nerve.

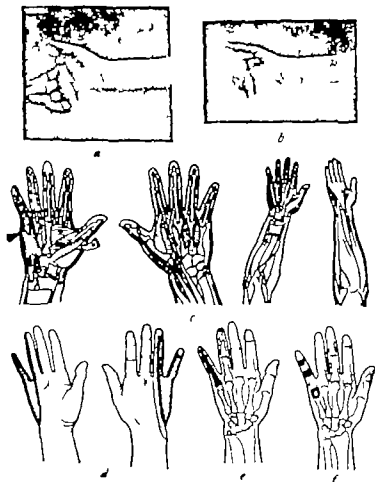


Fig. 130.—Findings in Case I of Djerina and Mourou seventy-four days after injury: *a* Attitude of hand at rest; *b* maximum flexion of fingers; *c*, voluntary and electric contractility of the muscles; *d*, cutaneous sensibility; *e*, *f*, *g*, joint sensibility.

CASE II—Compression of the outer surface of the ulnar nerve in the lower third of the arm. Dissociated syndrome. Patient wounded by shell fragment. Complete paralysis of the



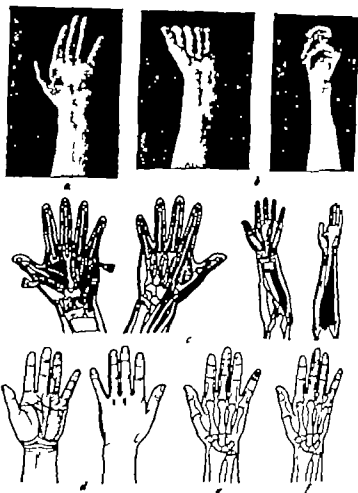


Fig. 131.—Findings in Case II of Diaper and Mowson seven days after injury. *a*, Attitude of hand at rest. *b*, maximum flexion of fingers. *c*, voluntary and electric contractility of the muscles. *d*, cutaneous sensibility; *e*, bony sensibility; *f*, joint sensibility.

flexor carpi ulnaris, of the inner fibers of the deep flexor and of the adductor of the thumb (Fig. 131 *c*). Paralysis of the inter

ness, more marked in those of the first spaces than of the last spaces. Paralysis of the muscles of the hypothenar eminence. Irritation of the superficial anterior cutaneous branch of the hypothenar eminence (Fig 131 d) Integrity of the dorsal ulnar branch (Fig 131 d) Slight irritation of the median. Impaired bony sensibility of the phalanges of the ring and little finger especially the terminal phalanx of the latter (Fig 131 e) Absence of *griffe cubitale* (Fig 131 a b) Operation by Gosset revealed outer surface of ulnar nerve compressed by dense scar tissue.

These 2 cases show that the distribution of the disturbances, or their predominance in different territories—cutaneous muscular or osseous—varies as the lesion involves the internal portion of the ulnar nerve in the arm or its external portion and also the absence of *griffe cubitale* in the case in which the lesion involved the external portion of the ulnar nerve and its existence in the case in which the lesion involved the internal portion. As to the different effects produced when the ulnar nerve has been injured above or below the elbow the following studies have been made by Ducoûté and verified by him in 50 cases.

Ducoûté states that—as so frequently happens in peripheral nerves—cubital paralysis” is a mixture of contracture and of paralysis. Thus, if the ulnar nerve is divided in the arm, *i. e.* above the origin of the upper branches to the flexor carpi ulnaris and two inner bellies of the flexor profundus these muscles are paralyzed while if it is divided in the forearm, *i. e.* below the origin of these branches, these same muscles immediately contract. In the latter case there is seen the clinical picture shown in Fig 133 16 flexion of the second phalanx of the little and ring fingers by contraction of the flexor profundus (inner heads) and by contraction of the flexor carpi ulnaris, flexion of the fifth and secondarily of the fourth metacarpals, and rotation of the ulnar border of the hand upon the radial border paralysis on the other hand, involves the interossei, the two inner lumbricals and the hypothenar muscles and the adductor of the thumb and its short flexor are the seat of paresis. To these

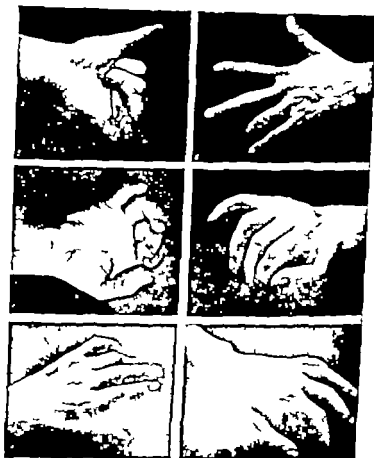


Fig. 132. —Studies of *mas* on *griff* from *raiki* severe by Ducasté 5 High lesion of ulnar nerve—best of flexion 6, same as 5—best of extension 7 and 8, lesion just below elbow—initial period of *griff*—abduction of little and ring fingers adduction of index, little powers under the middle finger extension of proximal phalanx according to 5 to 2 abduction of first meta carpal 9 Incomplete lesion in lower forearm—initial period of *griff* little contracture of wrist 10, same lesion as 5 and 6—initial period of *griff*.

contrary effects Ducasté applies the term the law of *contracture d'amalement* and states the contractures of the flexor carpi ulnaris

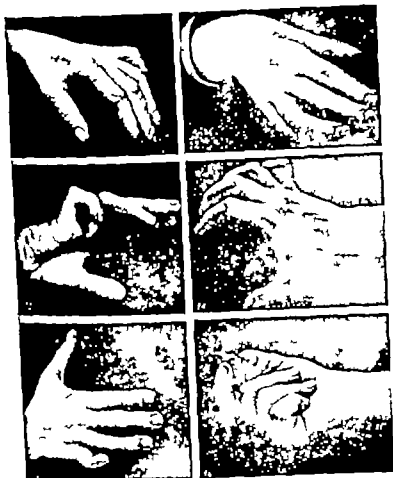


Fig. 133.—Studies of hands on griffe, from mild to severe, by Decroix. 11, Lesion of median and ulnar—initial period of griffe; 12, lesion of ulnar at elbow—initial period of griffe; 13, 14, 15 partial lesion of ulnar just below elbow—established griffe; 16, lesion of ulnar in lower forearm—contracture *à croc*. three months later rapid appearance of syndactylism of secondary irritation; the proximal phalanx of the fifth, fourth, and third fingers became fixed that of the second also, but less the thumb is carried in adduction and remains in opposition. kb index

and flexor profundus persist in natural sleep disappear under a general anæsthetic, to return when the patient awakens, but

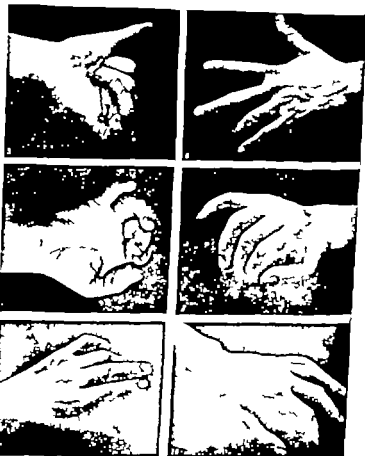


Fig. 132—Studies of *manus en griff* from mild to severe by Ducoasté. 5, High lesion of ulnar nerve—flexed forearm. 6, same as 5—limit of extension; 7 and 8, lesion just below elbow—initial period of *griff*: abduction of little and ring fingers; adduction of index, which passes under the middle finger; extension of proximal phalanx according to 5 to 2; abduction of first meta-carpal. 9, Incomplete lesion in lower forearm—initial period of *griff*—little contracture of *annet*; 10, same hand as 5 and 6—initial period of *griff*.

contrary effects Ducoasté applies the term "the law of *contracture d'annet*" and states the contractures of the flexor carpi ulnaris

instance it may cross the elbow before instead of behind the internal epicondyle, in which case it would probably escape the injuries to which we have referred. Again, Forrester Brown observed in the Edinburgh War Hospital several cases where the median nerve supplied all the intrinsic muscles of the hand though not the whole ulnar skin area one case was seen where some of the median muscles were supplied by the ulnar though again not its skin distribution. These cases are impossible to diagnose with certainty before operation, and they are liable to be reported as rapid recoveries, unless they are early and carefully examined after operation.

Adson refers to this lesion as progressive ulnar paralysis, stating it is a clinical condition which has long been recognized, but has rarely been treated surgically and that it has been diagnosed as progressive muscular atrophy and as a form of muscular dystrophy. The lesion is truly progressive in conformity with the underlying cause and permanent cure, therefore is only to be expected as the result of operative treatment. In early cases great improvement follows rest, but relapse takes place when the patient resumes the use of the limb.

As to treatment, when the signs of interference with the functions of the nerve are not complete (incomplete division) means must be taken to remedy the deformity and so prevent injurious pressure upon and irritation of the nerve. When the signs of interference with the functions of the nerve have advanced to the establishment of the reaction of degeneration (Sherrin) when at operation tests with the electric excitator (faradic current) do not show the presence of living axons the damaged portion of the nerve (scar neuroma) must be removed, and the anatomic continuity must be restored.

Among the operative measures employed to cure surgical neuritis of the ulnar nerve at the elbow the earliest was probably simple liberation of the nerve from the pressure in the groove, as practised by Potherat in 1897 but this can in no way permanently relieve the tension to which the nerve is subjected. Recurrence may also be anticipated after the second method namely deepening of the ulnar groove as carried out by

disappear immediately after injection of 1 or 2 c.c. of alcohol into the ulnar nerve at the ulnar groove.

The classic formula of sensory disturbances of the ulnar nerve is limitation of anesthesia to the little finger to the inner half of the ring finger and the inner border of the hand as far as the wrist. The symptoms and signs of lesions of the ulnar nerve have their maximum at the inner border of the hand and of the forearm and diminish progressively from the fifth to the second fingers, from the fifth to the second metacarpals, and from the inner to the outer border of the forearm, therefore

5 to 2. Vasomotor and trophic disturbances are present, also varying in intensity from "5 to 2" excretion of sweat and growth of nails are suspended in complete lesions, but increased in the incomplete, hypertrichosis, keratosis, and desquamation of skin decrease from 5 to 2 atrophy of the interosseal is late and progressive begins in the fourth interspace and is always more pronounced there (Figs. 132-133) osteoporosis affects in the beginning the innermost phalanges and metacarpals, the pisiform, ulnariform, cuneiform, semilunar os magnum and lower extremity of the radius, but very rapidly all the bones become rarefied and the process is more marked in the epiphyses. As to the articulations, anesthesia involves not only the finger joints, but also the wrist joint, and at times the metacarpophalangeal joints are painful to pressure.

In certain cases there is pemphigoid eruption with ulceration of the skin and there may be acute edema of the subcutaneous cellular tissue which Mougeot designates as false phlegmon.

The electric reactions should be determined in every case, not only to find out the extent to which the nerve is involved but also after treatment, in order to estimate the improvement. These electric reactions have generally been omitted but Noel has recently (1919) reported 10 cases of ulnar neuritis developing as late as fifty years after injury to elbow sustained in childhood in which the electric as well as physical examinations are given in detail.

There are certain variations in the course and distribution of the ulnar nerve that should be borne in mind. In the first

When by any of these methods the undivided ulnar nerve has been released from the tension to which it has been subjected there is often a surprisingly rapid return of function of the nerve sensation reappearing within the first few days after operation. The motor return is slower and when the nerve has been severely damaged complete restoration of function may be delayed a year or more.

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Sengeneze in 1898 by Guillemain and Mally and by Sherrin, the last adding to it resection of the neuroma. In this procedure recurrence may take place from the irritated periosteum reproducing bone or from adhesions arising between the denuded bone and the nerve.

The third method is the one of choice in the majority of cases and consists of freeing the ulnar nerve from its groove and transposing it in front of the internal epicondyle, where its bed is established either between the superficial and deep fascias or beneath the muscles. This method was practised by Roux, Bastianelli, Leclerc, Murphy, Curtis, and others, and is simple and satisfactory. In carrying out this procedure it is the writer's practice to divide the superficial fascia along the inner border of the biceps tendon, dissect it from the deep fascia toward the internal epicondyle, place the transposed ulnar nerve between it and the deep fascia, and then close the incision in the superficial fascia. The advantage of this over the technic in which elevation of the superficial fascia is begun at the internal epicondyle and carried laterally is obvious. By this third method, also lengthening of the nerve is obtained in case end-to-end suture is necessary; to secure the greatest mobility it is necessary to extend the incision sufficiently far to free the nerve well above and at the point where it pierces the internal intermuscular septum and when freeing it below from the heads of the flexor carpi ulnaris its branch to this muscle and to the inner heads of the flexor profundus digitorum should be dissected away from the main trunk for a considerable distance upward, as suggested by Naffziger until this important branch is of sufficient length to take its course through the ulnar groove, even though the main trunk is placed in front of the epicondyle.

The fourth method was employed by Mouchet in cases of tension of the ulnar nerve in fracture of the external condyle with cubitus valgus deformity. Here supracondylar cuneiform osteotomy of the humerus was performed to correct the deformity, no effort being made to expose the ulnar nerve nor even to touch it.

## UNUNITED FRACTURE OF RADIUS AND ULNA: INLAY BONE-GRAFTS

**Summary** Illustrative Cases Comments—Satisfactory Results with Albee Technic and Albee Electric Tools M. Williams Analysis of 1390 Bone-graftings Discussion of Murphy Intramedullary Method Difficulty of Obtaining Union in Fractures of the Middle or Lower Third of the Radius or Ulna Applicability of the Intramedullary Graft in Restoring Upper Portion of Humerus.

**Case L—J. P.** male aged twenty-seven, farmer on October 30, 1920 was attacked by a bull and thrown upon the ground, receiving an injury to the right forearm that turned out to be a simple fracture of lower third of radius and ulna. He was taken to a nearby hospital where, on December 29, 1920 at open operation, the overlapping of the fragments was overcome and the ends were freshened and held by catgut. Non-union resulted and the patient was referred to the writer on March 29, 1921—five months after injury.

*Physical examination* of right forearm revealed in its lower third a deformity with convexity at ulnar border and flail like motion at a point about 2 inches above wrist joint. Skelogram (Fig. 134) showed non-union of both bones with slight angular deformity. There was rotation of the proximal end of the radius, and callus was more evident in relation with the ulna fragment ends.

*Operation* (April 1, 1921)—Ether. Through the usual incisions the fragment ends were exposed and found the seat of pseudarthrosis. They were trimmed and squared and the rotation of the upper fragment of the radius was corrected in relationship with the lower. Using the Albee technic bone grafts were obtained from the right tibia, inserted into gutters made in the fragments, and retained with kangaroo tendons encircling host and graft. Care was taken to give the grafts plenty of length. The distal ends were driven well into the cancellous tissue of the distal fragments, and bone crumbs were



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**Case L.—**J P male, aged twenty-seven, farmer on October 30 1920 was attacked by a bull and thrown upon the ground receiving an injury to the right forearm that turned out to be a simple fracture of lower third of radius and ulna. He was taken to a nearby hospital where on December 29 1920 at open operation the overlapping of the fragments was overcome and the ends were freshened and held by catgut. Non-union resulted, and the patient was referred to the writer on March 29 1921—five months after injury

*Physical examination* of right forearm revealed in its lower third a deformity with convexity at ulnar border and flail like motion at a point about 2 inches above wrist joint. Skia gram (Fig 134) showed non-union of both bones with slight angular deformity there was rotation of the proximal end of the radius and callus was more evident in relation with the ulna fragment ends.

*Operation* (April 1 1921)—Ether Through the usual incisions the fragment ends were exposed and found the seat of pseudarthrosis they were trimmed and squared, and the rotation of the upper fragment of the radius was corrected in relationship with the lower. Using the Albee technic bone-grafts were obtained from the right tibia, inserted into gutters made in the fragments, and retained with kangaroo tendons encircling host and graft. Care was taken to give the grafts plenty of length the distal ends were driven well into the cancellous tissue of the distal fragments, and bone crumbs were

distributed about the ends of the fracture fragments to act as individual foci of osteogenesis. The deep tissues were approximated with catgut, and the skin incisions were closed with the same material. Dry gauze dressing. Plaster-of-Paris support. Before the patient came out of ether the fingers were passively hyperflexed on account of the slight stiffness in the interphalangeal joints that was noted at the time of physical examination.

*Postoperative Notes*—April 4th, three days after operation, non-bacterial edema of fingers and hand up to lower margin of plaster case, caused by nicking latter



Fig. 134.—Preoperative skilgram showing ununited fracture of lower third of radius and ulna.

April 8th, one week after operation wound reaction apparently sterile

May 16th, six weeks and four days after operation, plaster of Paris case and dressing removed. There is firm union between the fragments. Light yucca board dressing applied and skilgram taken. Skilgram (Fig. 135) reveals union with fragments in normal anatomic relationship. The pressure of the encircling kangaroo tendons has caused atrophy nicks most pronounced at interosseous border of radius fragments, showing the presence in the bones of a rarefying reaction. Massage requested

June 14th two and one-half months after operation, union

firm. Rotation of radius good. Limitation of motion in wrist joint, which was present previous to operation still exists but, together with finger movements, is disappearing with massage and use. Skin still slightly glossy and edematous.

June 28th, three months after operation, motions still steadily increasing in range. Swelling gradually subsiding.

July 28th, four months after operation, patient writes "I am working now and am getting along very nicely."

November 1st, seven months after operation, patient is steadily working at his occupation as a farmer with gradually increasing strength in right forearm and hand.

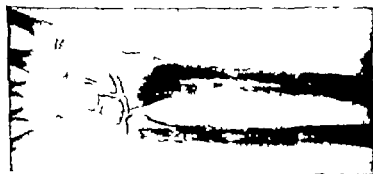


Fig. 135.—Postoperative skelogram showing union obtained by iliac bone-grafts.

Case II.—T. M. male aged twenty-eight, structural iron worker on March 1, 1921 fell 20 feet landing on first floor with right forearm behind him receiving an injury that turned out to be a simple fracture of radius and ulna below the middle. He was taken to a nearby hospital, where the fracture was set and splinted. Union not resulting after two months an operation was performed the nature of which is not known but probably consisted in catgut wiring of the fragments. Non-union of the radius resulted and the patient was referred to me on July 27, 1921—almost five months after the injury.

*Physic examination* of right forearm reveals about a hand-breadth above the wrist joint a concavity of the radial border

solution of continuity and preternatural mobility of the radius, and non-rotation of upper with lower fragment of latter. The ulna just above this level presents a slight convexity toward the inner border but union is firm and position satisfactory. Skiagram (Fig. 136) shows transverse fracture of ulna  $4\frac{1}{2}$  inches above its styloid process united in good position with strong ensheathing callus still evident and transverse fracture of the radius  $3\frac{1}{2}$  inches above its carpal articular surface with non-union. Irregular patches of callus approximation of rounded upper end of lower fragment toward ulna and probable union with same, and rotation of upper fragment in relation with

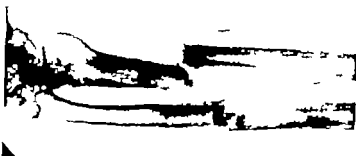


Fig. 136.—Properath skiagram showing separated fracture of radius. The ulna fracture is united in good position.

lower, there is at no place end-to-end contact; the lower end of the upper fragment lies lateral to the upper end of the lower fragment, and there is slight overriding with stripping of periosteum.

*Operation* (July 28, 1921).—Ether. Through the usual incision the radius fragments were exposed, trimmed and squared. There was a pseudarthrosis and the upper end of the lower fragment was firmly united to the ulna. The malrotation of the upper fragment was corrected. A transplant was cut from the right tibia, inserted into grooves made in the fragments and retained by kangaroo tendons. Bone crumb distributed about ends of fragments. Deep tissues approximated with catgut.

skin incision closed with same material. Dry gauze dressing Plaster-of Paris support.

*Postoperative Notes*—July 29th day after operation. Thumb beginning to swell distal end of plaster case trimmed away

August 4th, one week after operation, patient sent home. Skiagram (Fig 137) reveals good alignment of fragments.

September 13th, seven weeks after operation small stitch abscess present. Apparent bony union. Yucca boards applied.

October 21st, three months after operation radius rotates

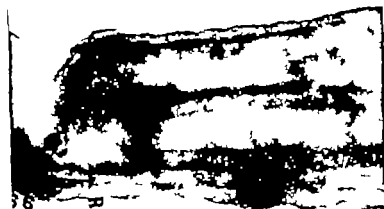


Fig 137—Postoperative skiagram showing inlay bone-graft in situ with improved alignment of radius fragments.

well and through a large arc. Wrist joint motion limited but greater than before operation.

December 28th, five months after operation, skiagram reveals firm end to-end union of radius fragments, but apparent osteoporosis of the graft, the upper portion of which has become sprung from its groove the graft will be removed as it forms a bulky projection lateral to the radius, while the purpose for which it was inserted has been accomplished.

In bone-graft work we get our best results with the unmodified Albee technic using the original method of inlay and the Albee electric tools. McWilliams (*Annals of Surgery*



September 1921 74 286) from an analysis of all graftings reported in the literature, together with the results obtained from a questionnaire has drawn the following conclusions.

From 1390 bone-graftings he found

1. That there were 82.3 per cent. of successes with 17.6 per cent. of failures.

2. In the order of successes

(a) With bone-pegs, 95.8 per cent. were successful.

(b) With the osteoperiosteal method (Delageniere) 87.3 per cent. were successful.

(c) With the end-to-end method (without inlaying) 82.5 per cent. were successful.

(d) With the inlay method 80.9 per cent. were successful.

(e) With the intramedullary method (Murphy) 76.6 per cent. were successful.

(f) With the combined intramedullary (at one end) and the inlay (at the other) 60 per cent. were successful.

3 The presence or absence of periosteum seems to exert no influence on the success of bone-grafts.

4 Suppuration occurred in 121 cases, or 8 per cent. 32 per cent. of these succeeded.

5 The conclusion is reached that the most successful method of bone-grafting is by the osteoperiosteal method which is as applicable to large as to small bony defects.

6. The cause of many non-successes is due to defective immobilization, or to undue curtailment of its duration. From four to six months immobilization is ordinarily required for complete success.

7 There is sufficient evidence to prove that the most effectual treatment of non-union of fractures is bone-grafting.

8. The causes of failures of bone-graftings, summarized, are

(a) Improper method of grafting.

(b) Suppuration.

(c) Insufficient immobilization or over too short a period of time.

(d) Fracture and dislocation of the grafts.

(e) Atrophy of the ends of the bone to be grafted.

9 The intramedullary method of grafting should be discarded.

10 Despite a few opinions to the contrary bone-graftings should not be performed in infected fields.

Murphy was a strong advocate of the intramedullary method of bone-grafting a diagram of his method will be found in Murphy's Clinics, August, 1916 674 Fig 137 He writes "Failures of union in fractures of the middle or lower third of the radius or ulna are the most difficult in which to obtain union following a transplant, excepting aplastic conditions of the lower end of the tibia and fibula." In conjunction with McWilliams statistics showing the smaller percentage of successes obtained by the intramedullary method, it is our opinion that this method is based upon false anatomic premises, for the medullary cavity is reamed out and the important endosteal cells are destroyed while the graft is not inserted so that corresponding layers contact (periosteum to periosteum, etc.) as Albee suggests. Particularly in the case of the radius and ulna, the bones are small, the intramedullary grafts cannot be much larger than a matchstick, and it is almost impossible to insert them in one bone after the other. In the case of restoration of the upper portion of the humerus after loss by resection, etc. the intramedullary graft has been found by us to act admirably



## COMMUNUTED FRACTURE OF HEAD OF RADIUS: RE SECTION OF HEAD

**Summary** Illustrative Case Operation Comments—Observations Based Upon Study of These Fractures: "Wlacing Tenderness Often the Only Sign of Fracture of Head or Neck Resection of Head Should Be More Frequently Performed in These Cases Technic of Avoiding Instability of Cervical Stump.

R. G. MALE, aged twenty two grocery clerk, on July 17 1921 fell off a wagon on to the street, striking upon right elbow. He went to a hospital, where he was treated by immobilization and later massage and motion for a period of three and one-half months. The improvement not being satisfactory he was referred to the writer by an interested party on November 3 1921.

Physical examination of the right elbow revealed 50 per cent. restriction of rotation of radius, tenderness over head of latter and incomplete extension. The grip was weak motion at wrist joint normal. Skiagrams (Figs 138 139) showed comminuted fracture of radius head with anterior displacement of fragments. In the profile view there is a suggestion of bony filling in of the olecranon fossa, against which the olecranon tip impinges, accounting for the incomplete extension. In view of these findings we felt that the restricted rotation of the radius was due to mechanical block from impinging of a deformed portion of the circumference of the head against the lower edge of the lesser sigmoid fossa, and that the obvious procedure therefore was removal of this mechanical block by resecting the head, removing at the same time the detached and displaced fragments.

Operation (November 4 1921).—Ether Longitudinal incision 2 inches long over radiohumeral joint dividing skin, subcutaneous tissues and capsule of joint synovia escaped freely. Orbicular ligament pushed downward until neck of

radius was exposed. Gill saw passed around neck of radius close to head, and bone divided at this level. Examination of the head showed that the larger and denser of the two anteriorly displaced fragments was adherent to the head and came away with it search was therefore made for the smaller and less



Fig 128.—Comminuted fracture of radius head. Front view.

dense fragment, which was found in front of the operative field lying against and slightly embedded in the inner layer of the anterior capsule of the elbow-joint. The fragment was removed and the wound was closed the subcutaneous tissues being approximated with catgut and the skin edges with silkworm-

gut. No drainage. Dry gauze dressing. No splint. Elbow held in sling.

Postoperative Notes.—November 12th eight days after operation, stitches removed—healing *per primam*. Patient advised to practice the “screw-driver” movements.

December 28th, two months after operation, rotation of radius practically restored to the normal range. It is not thought that the limitation of extension from olecranon fossa block will interfere with the patient's occupation as a grocery clerk.

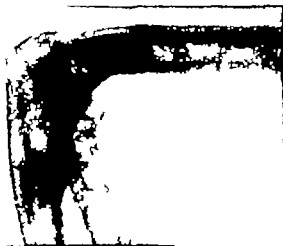


Fig. 139.—Comminuted fracture of radius head. Profile view.

The specimen of the radius head when examined after operation showed a vertical fracture in addition to the two fragments of comminution. The circumference of the head instead of being smooth, was irregular so that it could not articulate properly with the lesser sigmoid fossa.

In a study of 299 fractures made by us in 1913 (International Clinics, Vol. II 23d Series) there were 54 fractures of the radius alone of which 5 involved the upper end. Of these 5 2 were of the head and 3 of the neck, of which one showed, in addition a small chip separated from the anterior lip of the head. One

patient had no swelling, no ecchymosis, and no separation of the head from the shaft—merely pain on the screw-driver movement and definite localized tenderness over the neck. Since that time we have seen many cases with just as few signs, and many have been diagnosed clinically by the localized “wincing” tenderness alone—a sign that always justifies the taking of a skiagram. We have also found when the head or neck of the radius has been fractured by direct violence that the external epicondyle is apt to be chipped by the same trauma.

We believe that in cases of fracture with prolonged disability the head of the radius should always be resected to remove the mechanical interference with rotation of the shaft. Postoperative instability of the cervical stump can be prevented by preserving the orbicular ligament by pushing it distally and then removing the head at its junction with the neck, the result being a long cervical stump gripped by the orbicular ligament.

## UNUNITED FRACTURE OF TRANSVERSE PROCESS OF FIFTH LUMBAR VERTEBRA WITH MASSIVE CALLUS; ABLATION OF DISTAL FRAGMENT WITH CALLUS

*Synopsis* History of Case Operation Comments—Importance of Routine Ray Pictures of Back Injuries Advantages of the Bockey Diaphragm Citation of Somewhat Similar Case

W. M. MALE, aged fifty-six, laborer on May 21 1921 was jammed between a ladder and paddle of tub on which he was working receiving an injury to the back. About four months later the patient was referred by the Referee of the Compensation Board to Dr. A. S. Ross, Surgeon of the New Jersey Rehabilitation Commission, Camden Clinic, for examination from whose report I quote "I find that this man is very tender over the fourth and fifth lumbar vertebrae. It hurts him to stoop and then resume the erect posture. Skiagram (Fig 140) shows that the transverse process of the right fifth lumbar vertebra has been injured and callus has been thrown out to such an extent that apparently it has united with the crest of the ilium. This picture doubtless explains the patient's pain on motion. I would advise from the x ray that an incision be made and this mass of callus removed. There was also pressure neuritis of the fifth lumbar nerve, the patient complaining of shooting pains along its path, which kept him awake at night. Through Dr. Ross the patient was referred by his employer to the writer for operation.

Operation (October 22 1921)—Ether Inverted goblet shaped incision over right iliac crest, the cup of the goblet following the curve of the crest, and the stem passing upward a short distance along the outer border of the erector spinae. Skin superficial and lumbar fascia divided erector spinae reflected from ilium and sacro-iliac groove and elevated toward midline until the callus mass was encountered. This callus



mass was freed from the surrounding soft tissues, chiseled away from the ilium, and removed together with the distal fragment of the fractured transverse process. As soon as the mass was chiseled from the ilium it was found to be loose the absence of a proximal bony attachment proving the non-union of the fracture. The erector spinae was now replaced and the lumbar fascia was sutured over it with catgut. Superficial fascia closed



Fig. 140.—Laminated fracture of transverse process. b excess callous formation.

with catgut, and skin edges approximated with silkworm-gut. Drainage. Dry gauze dressing.

Postoperative Notes.—October 23d, the day after operation patient states that when he came out of ether he noticed the shooting pains were gone.

October 29th, one week after operation, stitches removed. Wound healed *per primam*. Patient feels much relieved.

December 16th eight weeks after operation. the patient

states that since the operation he has been able to sleep soundly at night, and that he no longer has the shooting nerve pains. There is still a little stiffness lingering in the back but the patient feels able to return to his laboring work.

Doctor Ross, through whose hands thousands of compensation cases pass annually tells me that within the last year he has sifted out about 15 cases of fracture of one of the processes of a vertebra, and that most of these cases had previously been treated for "humbago." He uses the x ray routinely in all back complaints and finds the Buckey diaphragm of the greatest aid in clearly defining a lesion of this type. (See also Potter Amer Jour Roentgenol February 1921 8 61)

A case in some respects similar to the above was reported by Magnuson and Coulter (International Clinics, Vol. II, Series 30) under the title Lower Lumbar Injury with Callus Formation. This patient, through a fall from a height "severely traumatized the articular facets in the lower lumbar spine at the same time tearing loose the attachments of muscles on the lamina and also received an injury to fibers of the lumbosacral ligaments which tore loose periosteum which has since formed the callus that is apparent in the x ray." This skiagram shows a "narrow low-lying fifth lumbar vertebra with ragged callus formation the size of a hazelnut to right of body and between fourth and fifth vertebrae also a long lateral process on the same (right) side which impinges on the ilium. The authors state "It is a matter of common knowledge that these long processes in the lower lumbar region may be present for years without any symptoms, but that a sudden strain or wrench will develop symptoms which grow progressively worse. This seems to be analogous to the pathology of cervical rib. The long fifth lumbar processes carried to a greater degree constitute the sacralization of the fifth lumbar which is not unusual and which is more easily injured than an upstanding fifth lumbar



## CLINIC OF DR F E. KEENE

UNIVERSITY OF PENNSYLVANIA

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### UNILATERAL RENAL TUBERCULOSIS ASSOCIATED WITH STRICTURE OF URETER, HYDRO-URETER, AND HY DRONEPHROSIS

THE patient whom I shall bring before you today presents the following history

Miss E H aged twenty four Previous medical history In 1913 an appendectomy was performed and in 1917 she had a second operation, at which she was told the stump of the appendix was removed. No other illness.

*Present Illness*—Her chief complaints are marked frequency of urination and pain in the right loin and lower right abdomen. For ten years or more she has had pain in the right loin and right lower abdomen at times of a dull aching character at others very sharp and shooting. The operations above referred to were performed with the idea that the appendix was the cause of this pain, but on neither occasion did she experience relief from the operation. With the sharper attacks of pain she has noticed a radiation toward the bladder associated with urgent desire to void urine and she feels a sensation of straining but is not always able to void. For a number of years she has had marked frequency and urgency of urination, at times finding it necessary to void every ten or twenty minutes. These urinary disturbances are present both by day and by night. At no time has she noticed blood in the urine. She has considerable epigastric discomfort after meals, with a sense of heaviness and nausea and occasionally she vomits thin, watery material. The bowels have always been somewhat constipated. There has been no loss in weight and her general

health seems to have remained about the same. She has experienced no difficulty in menstruation with the exception of an occasional painful period.

In looking over this history therefore we find the chief symptoms requiring our interpretation are, first, frequent and painful urination, and, second, pain in the right loin and right lower abdomen. These symptoms have been present for over ten years, antedating her operations for appendicitis, and were in no way affected by these operations.

*Physical Examination*—Temperature, pulse and respirations normal. The heart and lungs show no evidence of disease. On abdominal examination there is tenderness in the region of the right kidney but no enlargement of the kidney can be detected. There is also tenderness along the course of the ureter of the right side.

The left kidney is not palpable and we can make out no abnormal findings in other abdominal organs. Pelvic examination is likewise negative.

*Urinalysis* Cloudy specific gravity 1018 acid albumin very faint cloud sugar negative.

*Microscopic examination* shows 2 to 4 red blood-cells and from 85 to 100 white blood-cells to the field.

On cystoscopic examination the bladder capacity is reduced to 4 ounces. The base of the bladder and both ureteral orifices are normal, showing no evidence of any infection. The top of the bladder shows edema, and in the center of this edema to the left of the median line is an area of intense congestion in the center of which are two small superficial ulcers each about the size of a pinhead. Just to the right of the median line about 2 cm. further back than the ulcers above referred to is an area of scar formation on the apex of which an ulcer of considerable size and two smaller ulcers are visible. The left ureter was catheterized and the catheter met no obstruction in its passage to the kidney. The flow of urine from the catheter was normal. On attempt to catheterize the right ureter an impassable obstruction was encountered 6 cm. from the ureteral orifice and even the smallest catheter could not be entered beyond this point.

Urine flowed through the catheter however and appeared quite turbid. Indigocarmin appeared from the left ureteral orifice in copious quantities and as a dark blue stream in less than eight minutes. On the right side there was no appearance of the dye until fourteen minutes, and then it came as a faintly blue stream with no increase in the intensity of color at the end of twenty minutes. At a second cystoscopic examination the same obstruction was encountered at the lower end of the right

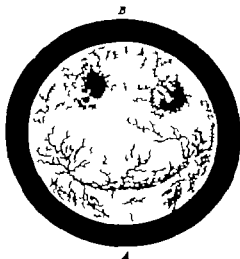


Fig. 141—Cystoscopic picture showing normal ureteral orifices and bladder base (A) (B) The inflammatory area containing five small ulcers, situated at vertex of bladder

ureter. In the hope that we might be able to demonstrate a hydro-ureter above the stricture, a 25 per cent. solution of sodium bromid was injected into the right ureter and a pyelogram made. The plates however showed that none of the solution passed above the site of obstruction, nor was a calculus shadow visible in either kidney or ureter.

Examination of the urine collected from the right ureter showed a large amount of pus and sterile culture. Tubercle bacilli or other bacteria were not demonstrable by smears.

Cultures of urine taken from the bladder were likewise sterile and inoculated guinea-pigs showed no evidence of tuberculosis.

Examination of the blood showed a moderate leukocytosis, namely 10,500 white blood-cells Wassermann reaction negative.

**Summary of Objective Findings.**—1 Sterile pyuria in specimens obtained from both the bladder and right ureter. This is strongly indicative of a tuberculous infection but not necessarily pathognomonic. Failure to demonstrate the tubercle bacillus by smear does not mean that such an infection is not present, for in our experience positive findings have been reported in only about 60 per cent. of cases proved tuberculous by operation. We have found that guinea pig inoculations give positive findings in between 75 and 80 per cent. of cases of renal tuberculosis. But here again a negative test does not rule out the presence of the lesion. Repeated examinations of smears and guinea-pig inoculations will often give positive findings when the first examinations have been negative.

2. Examination of the urine collected from the left kidney shows its anatomic integrity. The early and free elimination of indigocarmine indicates its normal functional activity and the frequent contractions of the ureter with the ejection of large streams of urine warrant the conclusion that it has undergone a compensatory hypertrophy. The delay as well as the diminished output of the dye and the demonstration of pus-cells in the urine from the right kidney show it to be the seat of an infection which has greatly impaired its function.

3 Stricture of the right ureter. At each of our examinations an impassable obstruction has been met 6 cm. from the retrol orifice but on leaving the catheter *in situ* urine could be collected showing the obstruction to be incomplet. A negative x-ray makes the presence of calculus unlikely although in this position a calculus may easily escape detection. Failure of the sodium bromid solution to pass above the point of obstruction indicates an organic lesion and not merely the engagement of the catheter tip in a fold of mucosa or against the wall of the ureter which has abruptly changed its direction. We have encountered such apparent obstructions in several instances.

especially in the presence of a cystocele and one must bear these possibilities in mind before concluding that a true obstruction is present.

4 The right ureteral orifice and the surrounding mucosa present a normal appearance, showing no evidences of infection and urine can be seen to appear with each ureteral contraction, confirming the evidence obtained from the ureteral catheter that the obstruction is not a complete one. In long-standing renal infections the ureteral orifice of the diseased side commonly shows such changes as edema redness or ulceration. This applies especially to tuberculous infection of the kidney and quite characteristic changes are practically always present in cases of long standing unless we have to deal with the so-called closed lesion when the orifice and bladder may be normal. These facts together with the apparent duration of the disease certainly point against a tuberculous infection as being responsible for the lesions in this case.

5 An ulcerative cystitis affecting only the top of the bladder. In women, a primary cystitis is extremely rare and no case should be considered as such until definitely determined by appropriate examinations. It usually arises secondarily most frequently from renal infection, but may take its origin from a neighboring infection in the pelvic organs. This case typifies the general rule in that the bladder changes are incident to a disease in the kidney. Rarely we encounter cases of ulcerative cystitis which are apparently primary in the bladder and further on I shall discuss this lesion at length because of its interest and importance. Based upon these deductions our preoperative diagnosis was as follows:

- 1 Incomplete inflammatory stricture of the right ureter probably non-tuberculous.

- 2 Infection of the right kidney with considerable destruction of the renal parenchyma, the type of infection not determined.

- 3 Anatomically and functionally normal left kidney.

- 4 Ulcerative cystitis simulating the elusive ulcer of Hunner in its cystoscopic picture.



**Operation.**—In order to definitely determine the character of the stricture and at the same time the condition of the ureter above it, a small median incision was made. On palpation of the lower end of the ureter a localized thickening was found situated at a point determined by our examinations and about

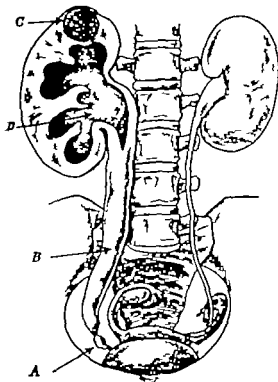


Fig 142—Schematic drawing showing: *A*, Stricture of ureter; *B*, hydronephrosis; *C*, abscess; *D*, hydroureter

1½ cm. in diameter: it was distinctly fusiform in shape tapering off toward the bladder. Below this the ureter was normal. Above the stricture the ureter was greatly dilated and thinned out, its caliber being almost that of the small intestine. On following up the ureter this dilatation extended to the kidney

which was the seat of a large hydronephrosis. The pelvic organs were normal. Through a lumbar incision the enlarged and densely adherent kidney was exposed and removed, together with about 7 inches of the ureter. Because of the density of the obstructed area the possibility of a small calculus was thought of and a wax-tipped bougie was passed, but this showed no scratches. The stricture was dilated so that a No. 13 catheter was easily passed into the bladder. The wound was closed without drainage. Examination of the specimen showed a large hydronephrosis with marked dilatation of the calyces, although a considerable amount of normal appearing renal parenchyma was still present situated at the upper pole of the kidney and apparently not communicating with the pelvis was an abscess the cavity of which measured 4 cm. in diameter and was evidently tuberculous in origin. The walls of the renal pelvis and ureter were very thin, the lining was perfectly smooth showing no evidences of a tuberculous infection. Microscopic examination of these tissues confirms these findings. We must explain these findings, therefore upon an unusual manifestation of a primary renal tuberculosis with secondary stricture formation within the ureter which led to an enormous dilatation of the ureter and renal pelvis. It is not a far stretch of the imagination, however to place another conception upon the development of these lesions, namely that the ureteral stricture with the secondary changes in the ureter and kidney was a primary lesion and that because of the diminished resistance on the part of the kidney a tuberculous infection had been secondarily engrafted upon it. Such a conception is borne out, first, by the cystoscopic picture second by the pathology found within the ureter third the duration of the disease. The question of ureteral strictures has been receiving considerable attention of late due largely to Hunner who has reported a very large series of cases. We have been very much interested in this question, but in spite of every effort to detect them we have not been able to demonstrate their presence by any means so frequently as Dr. Hunner would lead us to believe they may be found. According to him these lesions may be either single

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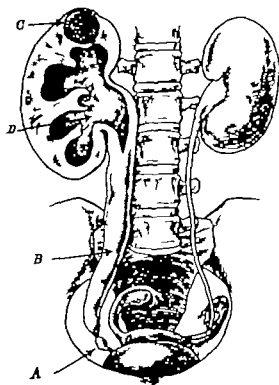


Fig. 142.—Schematic drawing showing A Stricture of ureter; B hydro-ureter; C abscess; D hydrocephalus

1½ cm. in diameter it was distinctly fusiform in shape tapering off toward the bladder. Below this the ureter was normal. Above the stricture the ureter was greatly dilated and thinned out, its caliber being almost that of the small intestine. On following up the ureter this dilatation extended to the kidney

As previously stated a primary cystitis in women is to be looked upon as a rare occurrence. In the case which we have just discussed the picture presented closely simulated that of the type described by Hunner as elusive ulcers of the bladder with the very important exception that there was an associated renal lesion while in the elusive ulcer the kidneys are always normal and the bladder lesion exists independently of any other demonstrable pathology so far as the pelvis and urinary tracts are concerned. Since Hunner first described this lesion in 1914 we have been very much interested in the subject and to date have had 17 such cases under our observation.

While this type of lesion is by no means common, it occurs with sufficient frequency to warrant a careful examination in every case presenting marked bladder symptoms. We feel confident that the condition is often overlooked not only because of the failure to make a careful inspection of every portion of the bladder but also to lack of proper interpretation of the findings, which in the early cases may show very little variation from the normal so far as gross changes are concerned.

Because of the difficulty often experienced in locating these ulcers Hunner has described them under the name of elusive ulcer a nomenclature, of course which in no way describes the pathology with which we are dealing. Grossly the lesion is characterized by more or less thickening of the entire bladder wall, with edema and minute superficial ulceration of the mucosa. The disease is practically always limited to the vertex of the bladder although rarely it may extend downward and laterally on one or both sides to within a few centimeters of the trigone. The disease is never patchy in distribution, but is limited to one section of the bladder. The inflammation may extend beyond the bladder confines, involving the paravesical tissues and adjacent peritoneum. The mucosa is thickened and edematous and the diseased area stands out in sharp contrast to the normal bladder. The ulcers may be single or multiple and in our series the latter has occurred more commonly. The areas of ulceration are always minute and very superficial. The lightest touch of the ulcer area produces severe pain and is always followed immediately by bleeding.

or multiple and are usually situated in the lower portion of the ureter. Such lesions are not tuberculous in origin, but in *Hunner's* opinion arise secondarily from some focus of infection, such as teeth, tonsils, sinuses, etc., and start as an infection of the peri-ureteral lymphatics. According to him the symptoms are quite characteristic both from the subjective and objective standpoints and treatment by means of dilatation has been satisfactory in its results. While I cannot concur with *Hunner* in his opinion regarding the frequency of ureteral strictures, I do feel that he has called our attention to a lesion which should always be borne in mind in cases of obscure lateral abdominal pain and that every effort should be made to prove the integrity of the ureter in explanation of these symptoms.

The findings in this case likewise show the great importance of careful study in arriving at conclusions concerning abdominal pain. Each year we have admitted to the clinic a number of cases who have had operations of various kinds, but especially appendectomy for right-sided pain, and in whom on more careful examination we have been able to discover some lesion in the urinary tract to explain the symptoms. I cannot impress upon you too strongly the importance of a careful cystoscopic examination in all patients presenting vesical symptoms. We make it a rule to cystoscope every patient with vesical symptoms irrespective of the nature of the pelvic pathology which might well explain these symptoms, and it is rather surprising with what frequency we find lesions of the bladder or kidneys in no way related to the pelvic pathology which are responsible for the patient's urinary complaints. Of course in most cases, such as prolapse, tumor formation, pelvic inflammatory disease etc. the vesical symptoms are directly due to the pelvic lesion but their demonstration is a study of the greatest interest, and one will occasionally find an associated lesion in the urinary system that will render the gynecologic lesion of secondary importance.

A cystoscopic examination in women is easily performed, can be quickly done and the value of such a procedure can only be appreciated by one who has pursued this plan in a large series of cases.

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Microscopically the picture is that of an inflammation involving the entire bladder wall and perivesical tissues with increase in the amount of connective tissue, round-cell infiltration, and rather extensive edema. These inflammatory changes are also evident in many instances in the tissues surrounding the bladder.

**Symptoms.**—An analysis of the symptoms presented by our patients gives one common to all namely bladder pain with intense urgency and frequency of urination. The pain occurs during, more especially after urination, and the bladder never feels empty. Often the dysuria is exaggerated at night. Not infrequently the patient complains of pain in the lower abdomen, usually just above the symphysis on one or both sides of the median line and this is doubtless due to the extension of the inflammation to the peritoneum. For this reason the majority of our patients have had one or more operations performed upon the uterus or the adnexa for the relief of their bladder symptoms. The pain may be localized to the bladder and lower abdomen or may be referred, the points of reference being to the perineum, the vagina, or one or both thighs. The severity of symptoms varies in different patients, of course and one will often find more or less of a periodicity of exacerbation and remission lasting several weeks and entirely independent of treatment. Often the bladder symptoms are exaggerated for a few days prior to and during the menstrual flow. The symptomatology is usually one of long standing. In our series the duration varied from six months to fourteen years, the average being about four years. The characteristic picture of the urine in such cases is grossly normal, with the presence of a few leukocytes and red blood-cells on microscopic examination. In 2 of our patients the history of free hematuria was given. In most cases the urine is sterile.

**Etiology.**—We are at a loss thus far to explain the cause of this condition but believe with Hunner that it is due to an infection probably hematogenous in origin. The tubercle bacillus is certainly not responsible, for in all of our sections, which have been very carefully studied, there has never been

any indication of a tubercle infection nor have we been able to demonstrate by various methods of examination tubercle bacilli in the urine. Likewise the cystoscopic picture which these cases present gives nothing suggesting tuberculosis. We have made it a special point to examine very carefully for foci of infection in all cases presenting these symptoms and have been unable to convince ourselves that the teeth the tonsils or sinuses can be held respon sible.

Treatment.—We have tried various methods of intravesical applications in the treatment of these cases, and have come to the conclusion that no form of treatment will suffice except complete excision of the inflammatory area. As previously stated, one will meet occasionally remissions of symptoms which one might ascribe to certain types of treatment but such remissions occur in spite of rather than on account of treatment, and the severity of the symptoms will recur sooner or later. Therefore, when such a case presents herself we now advise excision rather than temporizing with other forms of treatment which we feel confident will prove a failure. Briefly the operative treatment consists in complete excision of the diseased area of the bladder wall and the limits of excision are determined not by the ulcers, but by the area of edema. Anything short of this will result in failure. The amount of bladder wall removed necessarily varies with the extent of the lesion. In some of our cases the capacity of the bladder has been reduced by operation to 3 ounces but it is remarkable how quickly the bladder expands for within two or three months after operation its content is practically normal.

Results of Operation.—Fourteen of our cases have been operated upon and the results following excision have been excellent. In 2 cases there has been a recurrence of the ulceration. In one of these the patient was perfectly well for eight months, when she contracted influenza at the time of the great epidemic. During this attack the bladder symptoms recurred and cystoscopic examination subsequently revealed two small ulcers in the top of the bladder. A second excision was performed and this patient is now well a year and a half after her



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second operation. The second patient was free from symptoms for two years. She has been seen only recently on account of the recurrence of her symptoms and we find a small ulcer gain at the top of the bladder which will doubtless require excision.

We are of the opinion that the so-called Hunner ulcer is a distinct pathologic entity with a definite symptomatology in which the only hope of cure lies in the complete excision of the inflammatory area. The results are most satisfactory in the great majority of instances and will bring relief to patients whose suffering has been intense and extending often over a period of many years.

CONTRIBUTION BY DRS C M DORRANCE AND  
J W BRANSFIELD

PHILADELPHIA

BURNS, WITH SPECIAL REFERENCE TO THE ACETIC  
ACID TREATMENT

A study of the surgical literature of superficial burns and their treatment will convince any reader that while much has been written we are still more or less ignorant of the causes that produce the pathology and altered physiologic functions.

The general and local treatments suggested by their very diversity of numbers show that surgeons are dissatisfied with their results, and are willing to try for a time any new method suggested by any clinic or well-known clinician.

Recently on visiting several institutions where a large number of burns were admitted yearly we were struck by the fact that the care of these cases was largely entrusted to the house staff and the pupil nurses.

Any treatment to possess value must be employed for a definite reason, and a knowledge of the accepted facts in the causes of the altered physiologic changes and pathology of burns is essential.

All burns which involve one tenth of the body surface regardless of the degree, must be looked upon as serious burns involving one-third of the body surface are most serious and those involving two-thirds of the body surface are nearly always fatal.

Children stand burns poorly women are more serious risks than men the Caucasians have more marked general symptoms than the negro. These facts suggest that the type of skin texture is a potent factor. The location of the burn is important. Burns about the face, particularly around the mouth or involving the distribution of the fifth nerve burns

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involving the genitalia, and burns on the flexor surface are more serious than in other locations.

The depth of the burn does not appear to be nearly as important as the extent of the surface involved. We have seen one extremity charred to the bone recover without exhibiting any of the shock or general symptoms seen in a superficial extensive burn of the back.

Eliminating the cases of burns which exhibit emotional symptoms caused by fear or anxiety a patient admitted to a hospital with a moderately extensive superficial burn shows evidence of shock—the pulse is rapid, the skin and mucous membrane are dry and the temperature is subnormal. In some cases the patient is suffering horribly while in others a sort of apathy exists.

Blood-pressure shows the systolic pressure to be reduced. The average readings in our cases varied from 110 to 90.

The urine is scanty, highly colored, of high specific gravity and frequently the first specimen shows faint trace of albumin, but no acetone or diacetic acid.

The blood-picture in the first three or four hours shows a marked increase in both the red blood-cells and the leukocytes. Variation of the erythrocytic count from 5,000,000 to 16,000,000 occurs; the hemoglobin varies from 95 to 120 while the white blood-cells show count in some cases as high as 80,000 with the polymorphonuclears disproportionately increased. Blood-smears reveal the presence of numerous platelets and foreign bodies and the erythrocytes show irregularities. The coagulation time is decreased as low as two minutes in some cases with the Dorrance-Bransfield coagulometer. We have been able by the blood-picture to make a prognosis. In cases where the red blood-cells are over 10,000,000 and the leukocytes over 50,000 death is imminent.

Unless death occurs in the first twenty-four hours these patients show improvement. The blood pressure returns to normal, the pulse-rate drops, the temperature becomes normal or is slightly elevated and the blood-picture returns to normal about the third day.

The urine on the second day as a rule, shows an increase in the albumin, but rarely diacetic acid or acetone occurs. These later substances occur on the third day

The causes of these constitutional symptoms have received many explanations. Those which have been looked upon with favor in the past decade are (a) toxemia (b) thrombosis and (c) vasomotor changes.

Dr Charles R. Barden, after performing 5 autopsies on cases dying within eight hours after injury concluded that poisonous substance was present in the plasma of the blood. These poisonous substances are some sort of toxalbumins, the nature of which and their mode of origin is as yet unknown.

Dr Salvioli, Markusfeld and Steinhause performed a most interesting and instructive experiment on rabbits. They found that if the ear of the rabbit is burned, the blood-supply having been previously cut off little constitutional disturbance resulted. On the other hand, if the blood-supply is left intact and the nerves are severed severe constitutional disturbance results.

Clinically the fact that the toxemia in the circulation plays an important part in the production of shock was demonstrated during the war. It was observed that patients admitted to the advance hospitals with severely crushed limbs on which a tourniquet had been applied frequently went into a state of shock when the constriction was removed. Cannon subsequently demonstrated this fact on dogs he crushed the muscles and then applied a tourniquet. Shock was delayed until the tourniquet was removed. In cases where no tourniquet was used shock occurred immediately after the injury

The toxalbumins appear to be formed immediately after the burn or injury. One might describe their effect as a biochemical explosion.

We attribute the increase in the blood-cells to a vasomotor paralysis with stagnations of the blood in the capillaries there is likewise a loss of the blood plasma with a thickening as it were of the blood. The same explanation accounts for the decrease in the coagulation time.

The autopsy table in the early cases reveals a pathology



which we attribute largely to the effect of the toxalbumins in the blood.

The most important finding in these early cases, according to Barden, is a focal degeneration in the lymphatic tissues and in the liver. A mild parenchymatous degeneration of the kidneys can likewise be demonstrated.

To anticipate a little we will describe here the findings which occur in later autopsies *i. e.* those cases which lived more than two days from the time of their burn. In these cases we find the presence of minute thrombi throughout the viscera advanced parenchymatous nephritis, enlarged spleen with areas of necrosis cloudy swelling of the liver degeneration of the heart muscle, duodenitis, and even ulcer formation. These advanced pathologic findings are due to the absorption of more toxins from the burned area.

To return to the study of our cases the improvement noted after the first day in mild cases continues, dependent upon the treatment employed, but in the more severe cases we find on the second or third day an increase in temperature pulse, and respiration, a marked restlessness, with alternating apathy. These symptoms are caused by a secondary invasion of more toxic material from the burned area.

Parts of the burn show a scab-like formation, and under this as well as under the dried burned skin a coagulation necrosis occurs and produces the symptoms enumerated and the pathology described above.

The urine in the case will now show an increased amount of albumin and acetone will appear in large amounts. A blood count taken now will show a beginning anemia which in the severe cases will go on to grave secondary anemia. Complications of tetanus, assuming no antitoxin was given, and scarlet fever may occur. If the patient survives this stage the slough will disappear and a granulating surface is exposed. Following this healing by granulation cicatricial tissue is formed and the resulting contracture may produce another complicating factor.

It has been our experience that burns caused by fluids, pro-

ducing the so-called scalds are more serious (area for area) than other types of burns.

**Treatment.**—Basing our treatment on the physiologic and pathologic changes caused by burns, we feel that we are at present obtaining better results with burns than we did in the past.

Our course of treatment is given in outline form to cover the main issues in moderately severe cases with some reference to changes indicated in the most severe types.

As soon as the patient is received into the hospital if in pain, a hypodermic injection of morphin and atropin is given, despite the oft repeated precautionary advice of the text-book against locking up the kidneys with opium. We know that with our forced fluid intake we do not get kidney suppression at least, we do not feel that morphin is contraindicated. The atropin is given to counteract the paralysis of the vasomotor system 1500 units of antitetanic serum is given at this time.

The average patient is in shock the temperature is subnormal, therefore heat must be applied. If the shock is marked we put the patient in bed without even undressing him, cover him with heated blankets and use the electric light cradle, without making any effort to give local treatment.

When the shock has abated the patient is immersed in a hot saline bath the clothing is cut away under water so as to float the inner clothing off with as little effort as possible. The temperature of the water should be maintained at 110° F

The first dressing consists of  $\frac{1}{2}$  of 1 per cent. sterile acetic acid. Gauze is not used, but sterilized turkish toweling, which retains the heat and moisture. The dressings are kept saturated at all times. As soon as the patient is placed in bed after the bath and applications of the dressings, 1000 c.c. of salt or glucose solution is given intravenously in mild cases hypodermoclysis may be substituted. This is repeated every eight hours if necessary. If the patient's temperature is below 98° F., a cradle fitted up with electric-light bulbs is placed over the bed and covered with blankets. A special nurse for the first three days is essential in the proper treatment of these cases.

Water must be given at frequent intervals and, if possible, a continuous Murphy drip should be instituted. If the location of the burn or other circumstances prevents this, small enemas of tap-water should be employed. The keynote of this second step in the treatment is the forced intake of fluids, the purpose being to dilute the toxins in the blood and to stimulate their excretion. The baths are given twice daily after the first twenty four hours. On the second day we begin giving *Bquid petrolatum* at frequent intervals our purpose being to offer a bland soothing substance to the congested lining of the gastrointestinal tract, as well as promoting evacuation of the bowels. We know that on the second or third day we get the secondary absorption of toxins from the burned area, and our efforts are now directed toward preventing this.

John A. Hartwell, of New York, revived the acetic acid treatment. He felt this caused a digestion of all necrotic tissue and established healthy clean granulations. We agree with him, but the acetic acid must come in contact with the necrotic area to accomplish this, hence we devised the scheme of cross-cutting the hardened, tanned charred skin with a safety razor blade, making the cuts through the entire skin thickness. The cuts are arranged like lattice work thus forming squares 2 x 2 cm. This procedure is well shown in the illustration (Fig. 143). Following this procedure we avoid to a large extent the reabsorption of this necrotic tissue the acetic acid almost eats this material and the bidaily bath washes off the excess.

Acetic acid is a clean, easily obtained material, and we feel it possesses a decided advantage over the picric acid, alumen acetate caron oil, or any of the ointments. The acetic acid is employed until we have a clear clean granulating surface. We have been impressed by the fact that we frequently find isolated islands of epithelial tissue under the slough. When the granulating surface covers a large area and skin-grafting is necessary the granulations must be made sterile. We have found that the best way to render this granulating surface sterile is to give the area a good scrubbing with a fairly stiff brush and warm green soap. An anesthetic is often necessary for this

procedure in order to do it properly. The bleeding is controlled by moist saline compresses for twenty four hours, and then Dakin's solution or dichloramin-T is applied. No attempt at skin-grafting should be made until you find less than 6 bacteria to the field. the presence of any hemolytic types contraindicates skin-grafting.

We have had more success with the full thickness graft of Wolfe or Kranso in these burn cases than with the Thiersch method.

It is necessary before skin-grafting to remove the faint bluish cicatricial edge which is usually found around the margin



Fig. 143—Cross-cutting charred skin to permit escape of toxic material.

of the wound. The grafts should be placed closely together and covered with the usual paraffin mesh. over this mesh we apply a tight saline compress. We feel that pressure on the graft is one of the most important factors in obtaining a "take." When the area is small, simple strapping of the granulating surface with strips of adhesive plaster will be sufficient to effect a cure. Occasionally an area which does not respond to adhesive strapping and for some reason or other skin-grafting cannot be done, may be treated with equal parts of castor oil and balsam

of Peru. This can be used for a day or two then restrapping the area for forty-eight hours, and returning to the balsam treatment for another few days. By alternating the various procedures, or using them in combination, most granulating surfaces will respond.

The question arises that if we are seeking to get rid of the slough, why not remove it surgically or do a débridement on admission or a few days later. Theoretically this would be ideal but we are dealing with a sick patient one who as a rule is not in condition to withstand either the shock or the anesthetic. In burns of a limited area of an extremity this method or its modification could be employed, but the danger of removing much normal tissue by a débridement must be considered.

Nature is much more conservative with tissue than we are, and unless delay is dangerous it is better to wait until the slough is outlined by its line of demarcation.

We have used Dakin's solution in some of the milder cases and have had success from the start, but we have not felt it was of value in the extensive burns and scalds outlined above.

The use of proper apparatus to obtain extension and the keeping of adjacent raw surfaces apart, as in burns of the fingers, is understood. We feel that we may err sometimes in starting too early on these procedures.

In a very sick patient we should attempt to offer him at all times the most comfortable posture even though we may obtain a deformity by doing this.

The early use of cumbersome painful appliances frequently renders the patient so uncomfortable that we defeat our first purpose by preventing the essential necessary rest and sleep.

If cicatricial deformities result they should be repaired early. We advise the use of the single or double pedicle flaps. The sliding flaps are not to be used for two reasons (1) they have a poor blood supply and (2) their vitality has been interfered with because of their adjacency to the burned area.

The use of the single or double pedicle flap permits complete excision of the cicatricial tissue thus rendering the possibility of cancer formation less.

Keloids can be prevented by the judicious use of x-ray and scar tissue in the healed area should have light massage early.

Some of the special types of burns, as sunburn, radium, and x-ray burns require special consideration.

The prophylactic treatment here naturally occupies the first place.

Sunburn can be avoided by the use of acetic acid before exposure to the sun. Apply it liberally over all the parts to be exposed, and permit it to dry on the skin before going out in the sun or water.

Following exposure continuous wet dressings of  $\frac{1}{2}$  of 1 per cent. acetic acid will as a rule, prevent the excessive pain. Blistering seldom occurs. The lifeguards obtain their healthy bronzed color by using vinegar.

When the burn has occurred we use continuous wet dressings of acetic acid. Morphin is given if the pain is sufficiently severe to prevent sleep.

When radium and x-ray are used in large dosage over a long period of time burns are likely to occur.

When treating malignancy one must at times disregard this possibility in order to give any help to the patient.

If a dermatitis occurs, dry zinc oxide powder is perhaps the best treatment. If sloughing follows, the slough must be removed and the wound treated by the usual surgical procedures. Because of the frequency with which carcinoma occurs in such type of burns, it is good surgical judgment to completely excise all devitalized cicatricial tissue.

The deformity is corrected by the pedicle flap using a large pedicle or if indicated, a double pedicle flap. The flap is selected from an area which has not been exposed to the radium or x-ray.

The experienced surgeon, knowing that flaps will shrink at least one-third of their original size after the pedicle has been cut, is governed by this fact in selecting the area from which the flap is raised.



## CLINIC OF DR. JOHN F. V. JONES

### ST AGNES HOSPITAL

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#### CHRONIC CHOLECYSTITIS WITH STONES

I wish to show to you this morning a married woman of thirty two who was referred to me by Dr. C. J. Hoban. When admitted to St. Agnes Hospital January 24 1922 she complained of pain in the abdomen just under the ribs on the right side and also in the back.

Her 4 children are living and well and she has had no miscarriages. She never suffered from typhoid fever or other infectious disease.

For the past six years, at irregular intervals she has been constipated, has suffered from headache her abdomen has been distended and occasionally she has been nauseated. Now and then in the epigastrium or right hypochondrium there has been paroxysmal pain radiating to the back of the thorax (both sides). These seizures have lasted from a few minutes to three or four hours. In the last few months these paroxysms have been increasing in frequency and a particularly violent one on January 22 1922 caused her to agree to surgical interference. At no time before or since her admission, has she been jaundiced.

I did not see the patient during an acute attack. When I examined her there was considerable distention of her abdomen and a palpable tender swelling in the right hypochondrium. Her temperature was 98½ F., her pulse 82 and her respirations 20. Urinalysis was negative. x Ray negative. Hemoglobin, 70 per cent. erythrocytes, 3,990,000 leukocytes, 9800 coagulation time, seven minutes.

Dr. E. M. Heckert assisted me in the operation January 28, 1922. I shall report the results of the operation at a later date.



abdomen prepared in usual manner (iodin and alcohol) Kocher incision. Gall-bladder distended, indurated, diseased. Chronic obliterative appendicitis. Appendix removed and stump peritonized. Gall-bladder freed from multiple, dense adhesions, which bleed freely. Gall-bladder excised. All bleeding controlled except some oozing from liver. One piece of Iodoform gauze applied to the oozing surface. Except for small aperture, to accommodate Iodoform gauze abdomen closed in layers with chromicized catgut No. 2. Skin sutured with silkworm gut (interrupted). Anesthesia, ether. Anesthetist, Sister Melchior. Remarks by operator: Uterus and adnexa normal right kidney a trifle low left kidney in good position stomach apparently negative."

Today (January 31 1922) three days since the operation, her temperature is 99° F her pulse 90 and her respirations 20. She is as well as can be expected at this early date. I shall remove the gauze after two more days.

When the gall-bladder was opened there were found 50 to 60 stones of various sizes. At least half of these were small enough to pass through the duct and furnish her with attacks of gall-stone colic for years to come, indulgently presuming that no other condition (such as carcinoma) intervened. The gall-bladder itself was hypertrophied and manifestly diseased.

I do not remove the gall-bladder merely because it contains stones. If its walls are thin and it is apparently healthy I rest with a cholecystostomy. This, however was a gall-bladder that was obviously diseased. I am not entirely convinced that the gall-bladder has no function, and I know that the surgical management of recurrent gall-stones is easier following cholecystostomy than after cholecystectomy.

## GUNSHOT WOUND OF THE CHEST

THE next patient to engage our attention is a young married woman of nineteen who on November 6 1921 was shot in the chest. I arrived at St. Agnes' Hospital a few moments after the patient had been admitted. The projectile had pierced the soft tissues (anterior portion of the biceps) of the patient's right arm, apparently doing little damage there and had penetrated the right side of her chest. Closer inspection of the chest showed that the wound of entrance was in the fifth intercostal space on the midaxillary line of the right side. There was no wound of exit. The patient was in shock (pulse 160 temperature 97° F and respirations 28) but there was very little, if any respiratory embarrassment. The abdomen was quite soft. The wounds of the arm, as well as the wound in the chest, were iodinized and dressed with sterile gauze. The entire right side of the chest was immobilized by means of strips of adhesive plaster. Antitetanic serum was given external heat applied normal saline solution administered by vein and morphin injected.

Examination of the bullets remaining in the weapon with which the patient was wounded showed them to be of the un-jacketed, cylindroconoidal type and of 0.32 caliber. She was wounded by the ordinary revolver of civil life. She was shot at close range. The development of this last fact was due to no diagnostic perspicacity on my part, but solely to the fact that the patient had told me that the effective shot was fired by one in the same small room with her.

Dr Alfred S Doyle, roentgenologist to St. Agnes Hospital, localized the bullet in the right side of the pelvis. Meanwhile the patient reacted promptly from shock, and, in the absence of definite clinical symptoms ascribable either to the thorax or to the abdomen, I decided not to interfere.

Twenty-four hours later on November 7th, there were present the physical signs of a moderate amount of fluid in the right pleural cavity. This was verified by my colleague of the medical side Dr Francis J. Kelly. The abdomen continued soft. The temperature arose to 103° F. the pulse was 120 and the respirations 36 but regular and quiet. In the following three or four days the temperature, pulse, and respirations returned to normal. The patient gradually improved and went home in three weeks (November 27, 1921).

At no time have there been symptoms or signs attributable to the kidney, ureter, bladder or intrapelvic organs. At no time did we feel justified in exploring the abdomen. At no time did the hemothorax cause serious pressure.

Today the patient returns to us for examination. It is about three months since she was wounded. She has gained in weight. Her general health is excellent. Expansion of both lungs is equal. The hemothorax has apparently been absorbed because, as far as physical signs can tell us, it would now be difficult to say which lung has been involved.

I hesitate to advance even a speculation as to how the bullet became deviated into the pelvis. I shall not interfere with the bullet in the absence of symptoms. Were it lodged in the lung instead of the pelvis, and without symptoms, I would not attempt to remove it. If however a lodged bullet excites inflammation of the pulmonary tissues in which it is embedded and causes fever, pain, expectoration of blood, or cough, I believe that an attempt ought to be made to remove it—either by means of the bronchoscope as suggested by Chevalier Jackson or with the aid of the fluoroscopic screen according to the method of Petit de la Villeon, as described by E. Robin<sup>3</sup> and Le Conte. Certainly these two comparatively safe methods should be considered before resorting to one of the more formidable thoracotomies.

The possibility of removing a bullet from the lung by means

<sup>3</sup>Kenn. Surgery vol. viii, 1921, p. 322.

U. S. Naval Medical Bulletin, vol. 13, 1919 No. 2, p. 237.

Trans. Amer. Surg. Assoc., 1919 xxxvii, p. 144.

of the bronchoscope has been demonstrated by Dr Chevalier Jackson on a patient on whom Dr J Chalmers DaCosta pronounced thoracotomy unjustifiable. Dr Jackson by means of an instrument manipulated within his bronchoscope, bit through the wall of a bronchus, seized a bullet which had penetrated through the chest wall into the lung and extracted it by bringing it out within his bronchoscope.

*Jour Amer Med Assoc., 1921 May 1, p. 1178.*



## DOUBLE AMPUTATION THROUGH BOTH LOWER EXTREMITIES

THIS patient, a young man of twenty three, on the morning of November 29 1921 was riding in a wagon which was struck by a locomotive engine. When he was picked up he was unconscious but regained his senses on the way to St. Agnes Hospital.

Examination in the receiving ward showed that his left leg had been practically amputated that his right foot and ankle had been crushed beyond redemption, and that he had received multiple lacerations, abrasions and contusions of the scalp face and thighs. The skin and soft parts surrounding the left knee-joint had been destroyed and the left leg was united to the left thigh in ever so small a degree by a few strands of torn tendon. The tarsal and metatarsal bones of the right foot were crushed the right ankle joint was wide open and disorganized longitudinal fractures traversed the lower third of the right tibia and of the right fibula. The right foot was cold and blue. Neither the circulation of the right foot nor of the right ankle was perceptible. The patient's several wounds, lacerations, and abrasions were contaminated by cinders, coal dust, and greasy soil. A tourniquet had been applied to the left thigh. From the wound in the right ankle joint hemorrhage was slight.

On admission the patient's temperature was 97° F his pulse 120 and his respirations 26. While his wounds were examined and cleansed, antitetanic serum and appropriate stimulants were injected and external heat applied.

About one hour and a half after admission the patient, having reacted from shock was etherized and operated upon. Both his lower extremities were removed the left, by an amputation through the junction of the lower and middle third of the thigh the right by an amputation through the junction

of the middle and lower third of the leg. Doctors W. J. Ryan and P. F. Newman assisted me in the operation. Both in the thigh and in the leg anterior and posterior flaps, including muscle, were used.

The thigh stump healed by first intention in nine days, in spite of a badly infected laceration about 3 inches above the line of amputation. The leg stump became infected and healed more slowly leaving a small area of the anterior surface of the tibia exposed. January 10 1922 I reamputated the right leg, sawing through the tibia about 2½ inches higher than the site of the first section. The second amputation, as you can see, is through or a trifle above the middle of the leg—a location more suitable for the wearing of an artificial leg.

When Dr W. J. Taylor kindly consented to see this case with me on January 18 1922 (over seven weeks after the original operation) the thigh stump was 11 inches in length, as measured from the great trochanter the leg stump 7 inches, as measured from the lower border of the patella. As the leg stump had not entirely healed Dr Taylor counselled a delay of a few days in the consideration of the particular type of prosthesis applicable to this case. For the thigh stump immediately and for the leg stump as soon as healing took place, he advised daily massage, flannel bandage, measures calculated to improve their circulation, exercises to harden them and to render them weight bearing.

Today (January 31 1922) both stumps are almost healed and nearly ready for temporary artificial legs. Under the guidance of Dr Taylor I shall endeavor to apply to this case some of the prosthetic principles formulated by F. Martin<sup>2</sup> and explained in English by Le Conte.

Cathcart believes that the phrase seat of election ought

<sup>1</sup> Taylor W. J. in *Koenig's Surgery* 4th ed. vol. 1921

<sup>2</sup> La Prothese des Membres Inferieurs Masson et Cie 120 Boulevard Saint Germain, Paris, 1918

<sup>3</sup> United States Naval Medical Bulletin vol. 13, No. 2, April, 1919 p. 244.

<sup>4</sup> Charles W. Cathcart, *Edinburgh Med Jour* November 1920, vol. xxv p. 281.

to be dropped. Formerly when speaking of amputating through the leg, the surgeon used the phrase "seat of election" for an amputation a handbreadth or so below the knee, because then most patients were equipped with peg-legs only. A thigh stump was fitted into a wooden bucket and a patient with a below-knee amputation bore the weight of his body on his bent knee which rested on a pad on the peg leg. It was necessary therefore, in the case of the below knee amputation to fashion a stump just long enough to be knelt upon without projecting backward so far as to be in the way—2 or 3 inches was long enough. The art of artificial limb making however has advanced to the point where "below knee" buckets can be manufactured and these instead of peg-legs can be supplied to those cases with stumps long enough to enable their possessors to move their own knee joints.

Today "seat of election" means the length of stump most valuable for a "below-knee" bucket. Surgeons and limb makers differ as to the length of stump most suitable for this purpose.

For these reasons Cathcart prefers to saw the tibia at or a little below the middle of the bone. He declares that 4 inches is the shortest length of tibia which can be satisfactorily fitted with a below-knee bucket. He says, however, that he has seen in a few cases with sound skin covering a good result with 3 inches.

Dr W. J. Taylor says that in all amputations of the leg below the middle which is the point of greatest value for the wearing of an artificial limb the flaps are wanting in vitality while above this point there is diminished power of leverage. The same authority believes that the femur ought to be sectioned as low as possible in order to favor the greatest amount of leverage in the stump of the thigh.

The question of flaps has engaged considerable attention of late. In 1913 Estes<sup>1</sup> reported 724 major amputations from civil practice, and 674 of these were performed for crushing injuries received on railways, in mines, and in factories. In this report he said: "As to flaps. There is no set rule in regard



to them except that they must be wide and long enough fully to cover the stump without tension. It is preferred so to shape the skin-flaps that drainage is facilitated by the lines of incision. As much muscle as practicable is included in the stump. To me this advice seems as sound in 1922 as it was in 1913.

Frequently a brakeman or a switchman has been the victim of injuries necessitating multiple amputations this was so in the 2 cases reported by Montgomery Russell.

Usually it is a male who suffers in this manner but an exception to this rule is the case reported by Case. Case operated upon a schoolmistress of thirty-seven whose legs were caught under the wheels of a moving train.

My case is not one of synchronous amputation in the sense in which Estes<sup>1</sup> uses the term "synchronous." At the clinic at St. Luke's Hospital," writes he, "the multiple operations are done synchronously. That is to say the chief operator and the chief assistant operate at the same time on different extremities, each with a proper corps of assistants. I operated upon the thigh first and upon the leg immediately afterward. Now whether you consider these two amputations as two acts of the same operation, or as two operations under the same anesthesia, or as two sections at the same séance, the fact remains that the removal of the left extremity antedated the removal of the right extremity.

North-west Medicine, Seattle, April, 1904.  
M. E. Case, *Pacific Surgery* 1910, 4.  
*Annals of Surgery* July 1913.

## CLINIC OF EDMUND B. PIPER

### UNIVERSITY MATERNITY

#### THE TOXEMIAS OF PREGNANCY AND THE PUERPERIUM

THE patient is a young woman thirty years of age her medical history is entirely negative having had no illnesses other than the usual run of diseases of childhood she has had no surgical operations. Her previous obstetric history is that she has had two pregnancies that were successfully completed by the birth of two normal children. Her last menstrual period would bring the time of her admission to the hospital at about two weeks short of term. She had had no prenatal care from any clinic. The history of her condition during this pregnancy is not obtainable.

Upon admission the patient was unconscious and subject to frequently repeated general convulsions her face hands, and feet were edematous her output of urine had almost completely ceased. A vaginal examination disclosed the fact that labor had not commenced. Her blood-pressure was systolic 240 diastolic 160.

The history of this case with its physical findings is perfectly typical of the text-book picture of eclampsia. Let us go on with the treatment that was carried out in this case. The treatment of eclampsia as we see it is dependent largely upon the type which the particular case that is being studied may be and upon the progress of that case under the treatment as instituted. In other words we do not believe that it may be said for all cases of eclampsia do thus and so. Each case must be treated according to its progress. This particular case exemplifies this fact. Naturally the most important one factor in the treatment of this condition is the removal of its cause,

that is the emptying of the uterus. Now we believe that removal of the cause should be done in that manner which is of the least shock to the patient. If possible to deliver the child by vagina it should be done in this manner as soon as possible.

When this particular case was admitted to the hospital, as stated in our history she was not in labor she had a high blood-pressure and almost complete suppression of urine. She was, therefore, eliminated in the usual manner that is, we take it for granted that if her kidneys have ceased to functionate the chances are the rest of her abdominal organs have done likewise. Her stomach was washed out and large quantities of undigested food recovered. Her lower bowel was washed with a high enema. She was then given, through a stomach-tube, 2 ounces of castor oil and 2 drops of croton oil. Following this procedure she was put in a vapor bath, I mean by that we have a portable cabinet in which the patient receives moist heat, in cases in which the convulsions are not marked and there is no sign of cardiac failure these vapor baths are given every four hours. It so happens that very frequently the convulsions and their treatment are, fortunately a cause for the commencement of active labor. When this has been accomplished the labor is allowed to progress of itself as long as the patient's general condition remains good.

In this case rapidly increasing frequency in the convulsions, vapor baths, free catharsis, and all the rest of the attendant treatments had no effect whatsoever in even commencing labor. As time wore on the convulsions became increasingly more violent and the intervals between shorter and shorter.

Eight hours after admission the convulsions had become so violent and so frequent, heart action becoming more and more rapid, the patient was given  $\frac{1}{4}$  grain of morphin, repeated in an hour with  $\frac{1}{4}$  grain. She still continued having convulsions although this morphin had decreased their severity and frequency. At the end of ten hours we were confronted with the fact that we had a woman in whom neither the condition itself nor various methods of treatment had brought on labor. Furthermore to all intents and purposes, elimination and

sedatives had been of very little value. We therefore felt it was a matter of very grave importance that her uterus should be evacuated. This was done by cesarean section under nitrous oxid anesthesia. The patient has made as you see a complete recovery but, however this has not been calm and peaceful, but followed by an exceedingly stormy postoperative convalescence.

With this case as a text we can go into the classification and treatment of the toxemias of pregnancy and the puerperium.

For the sake of their treatment let us classify these toxemias as follows: (1) Toxemia of early pregnancy which may advance to a condition of pernicious vomiting. (2) the toxemia of middle pregnancy that is the condition occurring between the fourth and the seventh month. (3) the toxemia of late pregnancy in which the liver breakdown predominates. (4) the toxemia of late pregnancy in which kidney breakdown predominates. (5) the toxemia of the puerperium which may be similar clinically to either of the two preceding.

The toxemia of early pregnancy is familiar to all of us, and I will not go into the treatment of it at this time. This second class is one which I have brought out because it is rather rare, at least we do not often see it in hospital cases. The clinical picture is that of high blood-pressure, some headache, some slight defects in vision, very few urinary changes, very little edema. These cases present a very difficult problem. Should they be allowed to go on to term without interference? As a matter of actual fact they frequently decide the problem themselves with a premature labor of a stillborn child. In other words I believe that these cases are caused by one of two things, namely an underlying interstitial nephritis or these patients are syphilitic. Fortunately we meet this type of case very rarely.

We now approach the third and fourth classification which are important in that one must determine to which of these classes a given case belongs before we may go on with the treatment. This is not particularly difficult, and fortunately for our mortality the class of toxemia in which the liver predominates is comparatively rare. We may consider them both as

having progressed to the convulsive stage they therefore, then are both known as eclampsia. Their differentiation lies precisely in the one fact, that in the one liver breakdown predominates and in the other kidney. This may be determined, and it usually is, by observing the three points: blood-pressure, urine, and the clinical picture of the patient herself. In the liver type the blood-pressure is low: there are albumin and casts in the urine, but not in as large quantity as we would generally look for. The patient is usually jaundiced, though not always, and the edema is not as marked as in the kidney type. My experience of this type of case is most discouraging. In its treatment weakening elimination must be avoided and cardiac failure carefully watched for. The mortality in this particular type is extremely high. The other type of case in which the kidney breakdown predominates is the usual typical text-book eclampsia, and the picture is that of the case which we have just seen.

It has always been taught, and I believe rightly so, that it is dangerous to make a prognosis in any case of eclampsia. However for our own satisfaction we have evolved this scheme which was brought out some years ago in regard to the prognosis of uremia. When the diastolic pressure is to the pulse pressure as 2 is to 1 the prognosis should be good. When it is as 3 is to 1 it is doubtful. When as 4 is to 1 and higher absolutely bad. In other words, taking the normal blood-pressure of 120 systolic and 80 diastolic, we have a relationship of 80 to 40 or 2 is to 1. When that normal relationship between the two continues we feel that the organism is maintaining its fight, at least in so far as the heart is concerned. It is our firm conviction that patients recover or die depending upon whether or not the heart stands up under the strain. We believe that high systolic blood-pressure *per se* is not a definitely bad prognostic symptom. A systolic blood-pressure of 240 and diastolic of 160 which is exactly double the normal, is much better to deal with than a systolic blood-pressure of 160 with a diastolic of 130. I remember a case which clinically looked no worse than the ordinary run, but on the admission showed a systolic

blood-pressure of 160 and diastolic of 140. This gave a relationship between diastolic and pulse-pressure of 7 to 1. A bad prognosis was immediately given and the patient was dead in less than six hours. Personally I have seen tremendously high blood-pressures frequently recover while those in the neighborhood of 150 with a high diastolic almost invariably died.

In our treatment of the case shown you may note there was very little medication nor was venesection done. It is generally conceded venesection is of value but I believe that this should not be resorted to purely on account of the high blood-pressure, but only when it would seem that the right heart is distinctly embarrassed.

The treatment of eclampsia is definitely divided into three great groups. First, eliminative second, sedative and, third, operative. For many years each of these methods has had its advocates among noted investigators and clinicians. We believe that all three have their place and that in a great number of cases a combination of the three may be resorted to in the same case. I know that the advocates of the Stroganoff treatment (that is, the sedative) believe that that alone will give the best mortality figures. And if under this treatment a mortality of better than 10 per cent. can be accomplished those who rely on it are getting about as good results as is possible but, unfortunately all mortality figures must of necessity be so dependent upon the time and the progress of the illness when the treatment was instituted that it is extremely difficult to accurately determine. In the Obstetrical Clinic of the Hospital of the University of Pennsylvania over a period of more than thirty years each one of these three systems has been tried out separately two in combination and finally all three together as the case seemed to indicate. We believe that our results from the use of all three treatments are the best. The custom of operating immediately every case of eclampsia, that is admitted to the hospital, is doubtfully efficient. If the emptying of the uterus can be accomplished without too great shock in any other way than cesarean section we believe it should be done.

but where there is no sign of labor where the os is contracted, with a not easily dilatable cervix, and where the patient is becoming progressively worse in spite of eliminative and sedative treatment, it seems to me that cesarean section gives her the best chance for life. Up to the present I have said nothing about the more recent laboratory studies on these cases—blood urea examination, etc. This should be done wherever possible for investigation purposes but unfortunately our decision as to what must be done for the patient cannot wait for the results from these laboratory studies in all cases, and up to the present they have not been shown to be of any great value.

In touching upon the last classification, that of the toxemia of the puerperium, or postpartum eclampsia there is very little to be said. Personally I can think of no more discouraging type of case to be confronted by than this. The accepted cause of eclampsia has been removed and still the condition exists. Naturally in this type of case all we may do is to promote elimination and control the convulsions by morphin. I have had physicians say to me 'Would you give morphin in a case where you have kidney breakdown as in all these cases of eclampsia?' The only reply to that question is that where you have acute suppression of urine the kidneys are about as bad as they may be. The patient eventually dies when she dies from cardiac failure. Continued frequent severe convulsions bring this about. It seems to us that although we unquestionably are doing no good to the kidneys when we give morphin we cannot make them much worse, and by stopping the convulsions if we are able to do so, we are at least giving the heart a rest.

Until such time as we are enabled to discover the etiology of eclampsia we shall be, as we are now groping in the dark and doing the best we may.

## CLINIC OF DR. J STEWART RODMAN

### PRESBYTERIAN HOSPITAL

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#### INJURY TO THE CAUDA EQUINA

SPINAL injuries are comparable to cranial injuries, but it seems to me that an exact diagnosis can be made earlier and with more accuracy than is the case in the latter type of injury. We do not propose at this time to discuss such injuries in general since the pictures produced are so definite and, for the most part well understood. There is a type of injury to the spinal column and the contents of the spinal canal, however that is not as frequently seen as others, and therefore its symptomatology and the prognosis from the operative point of view is not so well appreciated. I refer to injuries to the cauda equina. In general, the prognosis of such injuries is much better than injury to the cord itself. The following case well illustrates an injury to the lowermost segments of the cord and cauda equina. The patient, a white male fifty two years of age a teamster by occupation, was brought to the hospital in agonizing pain, referred to his back and lower limbs, with the following history. He was driving his team into the stable when upon entering the door a beam over head caught him striking his shoulders, causing violent ante flexion of the body and thus squeezing him between this beam and the seat of the wagon. He was apparently bending forward, trying to dodge the beam. He could not move his legs upon admission at all, and as stated, he was suffering from severe pain. I saw this patient shortly after his admission to the hospital and because of the paralysis of the lower limbs accompanied by extreme pain made a diagnosis of probable fracture-dislocation below the level of the twelfth dorsal ver



tebra and asked for an immediate consultation with the neurologist of the hospital, Dr Cadwalader

His report was "The patient complains of severe spontaneous pain which is fairly well localized to the outer surface and lower portion of each leg below the knee. This pain seems to be worse on the outer surface of the left leg than on the right. It is difficult to estimate the exact extent of motor paralysis because of pain only the adductor of the right leg contracts, however. The knee-jerk and Achilles reflexes are all absent. There is no plantar reflex or Babinski's sign present. Manipulation of the limbs causes pain. There is no spasticity the limbs being flaccid. Sensation is greatly impaired, but touch and pinpoint over the outer surface of each leg below the knee and to a less extent over the inner surface and dorsum of each foot over the buttocks and posterior portion of each thigh there is diminution of sensation, but it is not abolished. Over the abdomen and thighs on each side sensation seems normal. It would seem that the lesion in this case does not extend above the level of the second lumbar segment of the cord. The character of the pain, as well as other findings, strongly suggest a lesion of the roots more than destruction of the cord substance, or both conditions. There is a distinct depression between two vertebrae the twelfth dorsal and first lumbar. An x-ray taken immediately showed fracture-dislocation of the last dorsal and first lumbar vertebrae. Inasmuch as there seemed little doubt, taking into consideration the history of the case and the physical findings confirmed from the neurologic aspect of the case, that there existed a fracture-dislocation of the vertebrae resulting from indirect violence due to forcible overflexion an immediate laminectomy was done. In the midline of the back and extending well to either side there was swelling and ecchymosis, the tearing and hemorrhage into the lumbar muscles becoming apparent after the incision was made. The skin incision was made over the spinous processes beginning on a level with the eleventh dorsal vertebra, downward for 4 inches. After separating the torn and lacerated lumbar muscles from the vertebra on either side fracture-dislocation was found of

the twelfth dorsal and first lumbar. The spines and laminae of these vertebrae, as well as the vertebrae immediately above and below were removed. There was no free blood upon the dura, which however was swollen and rather tense. Upon opening the dura a bloody fluid escaped and after the incision in the dura was enlarged the spinal cord itself appeared swollen and edematous in its terminal segments, and the cauda

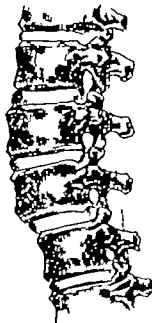


Fig. 144.—Fracture-dislocation of vertebra.

equina also had this appearance. The dura was not sown, as it was thought well to provide for relief of pressure. The muscles were closed in tiers and because of the hemorrhage into them a drain was inserted below. The skin was closed in the usual way. On the following morning the patient's condition was, in general, satisfactory although the pain had persisted the same in character as it was before. At the end of forty-eight hours the drain was removed and there had been quite a marked

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the lower extremities. However it was impossible to tell just how much of this was voluntary as the patient refused to make an effort to move any muscle of the legs, stating that any such attempt would cause great pain. His general condition had improved. After the second night the pain had improved to such an extent that morphin was no longer required. There had been no involuntary passage of feces and urine, the patient's bowels being opened by enema after the first forty-eight hours. He still however had to be catheterized and in fact this persisted for several weeks following the operation. Convalescence in so far as the general condition was concerned became established after the third day and a gradual improvement was noted both in sensory and motor functions in the lower limbs. The patient, however was not able to void voluntarily until approximately three weeks following the operation and unfortunately had developed by reason of the necessary catheterization, a cystitis in the meantime. This had been treated by bladder irrigations of 1:10,000 silver nitrate solution and by an indwelling permanent catheter. Approximately three weeks after the operation neurologic examination showed a distinct and clear voluntary contraction of the adductor and quadriceps muscles on each side the right, however being somewhat stronger than the left. There was no movement detected of the muscles below the knees. The wound healed normally pressure sores, which developed on the heels due to necrosis gradually cleared up and the patient was discharged, much improved at his own request, three months following the injury.

This patient, now nine months following the injury is able to walk with the aid of crutches, has entire control over both bladder and bowels, normal sensation has returned in the lower limbs as well as voluntary movement, with the exception of the dorsum of each foot and ankle. I believe that with further massage and electricity which he has had at biweekly intervals for the first three months following the operation, he will ultimately recover well enough to take a useful position although not in his former occupation of teamster.

From consideration of this case we can learn the lesson, first

return of sensory impressions throughout the entire legs and feet.

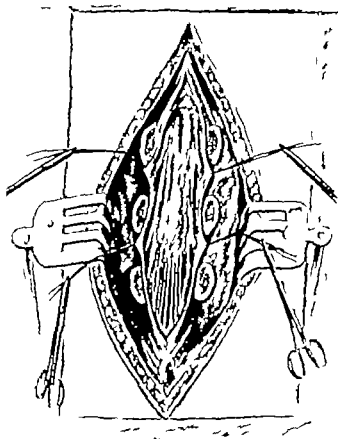


Fig. 145.—Swollen and edematous tip of cord and cauda equina. (Semi-schematic in order to show distortion of normal anatomic structures.)

At that time there was no appreciable difference in the motor function the patient still being entirely paralyzed in

stage was followed by the second after the lapse of three or four days if the patient had not succumbed to the original shock of the injury by the stage of "mass reflex" in which there was a change of the paralysis from the flaccid to the spastic type and return of knee reflexes, Babinski phenomena, and the automatic control of the bladder established. One of the most interesting features of this stage of "mass reflex," as pictured by Riddoch, is this automatic control of the bladder. He showed that when such bladders were filled with a given amount of urine say 300 c.c. that automatic stimulation resulted and emptying followed this he expressed as "firing off of the bladder." The stage of "mass reflex" persists in some cases for years, although as a general rule after several weeks or months of such apparent return of control the third stage followed, namely that of "diminishing reflexes" in which the spastic type of paralysis returned to the flaccid type automatic control of the bladder was lost, and the patient ultimately died of secondary infection, usually of the kidneys.

of all of a greater hopefulness in traumatic lesions of the cauda equina, particularly than we are justified in entertaining in regard to traumatic lesions of the cord. We can also learn that when the benefits of a decompressive operation are given early the results are better. The point in the history of this patient which at once should lead us to expect a caudal lesion was the tremendous pain in the lower limbs and the apparent lack of complete paralysis below the level of the lesion. It seems to me that in handling traumatic lesions of the spine and spinal cord a nicety of surgical judgment is required in order to select the case suited for operation. There is no question that operation is often not only inadvisable but harmful. Of course where the paralysis is immediate and complete below the level of the lesion, this complete paralysis involving not only voluntary motion, but involuntary reflexes, there has been a complete division of the cord and operative intervention is useless. There has never been a case on record of regeneration of damaged cord tissue where the injury has resulted in a complete division of the caudal substance. Drs. Harte and Stewart reported a case of gunshot wound of the cord operated upon by Dr. Stewart some years ago at the Pennsylvania Hospital. In this case there had been an apparent return of some function following suture of the cord, and for years it was quoted in the literature as a probable instance of cord regeneration. We now know as a result of Riddoch's work on such lesions growing out of the recent war and as the result of Cadwalader's careful study of the aforementioned case that such regeneration did not take place. It is true that a flaccid paralysis gave way to a spastic type and that there was an apparent return of some control over the bowels and bladder but Cadwalader clearly showed that the case had lived for years in a stage of "mum reflex," so clearly pictured by Riddoch, who showed that the sequence of events in complete cord division was, first, spinal shock, into which the case passed immediately after the injury this stage being characterized by complete paralysis below the level of the lesion as well as a complete loss of all sensation and power of control over the bladder, bowels, and sexual functions. This

